AFRL-SA-WP-SR-2016-0001

DoD Global, Laboratory-Based, Influenza Surveillance Program, End-of-Year Report, 2014-2015

Laurie DeMarcus

January 2016

DISTRIBUTION STATEMENT A.
Approved for public release.

STINFO COPY

Air Force Research Laboratory
711th Human Performance Wing
U.S. Air Force School of Aerospace Medicine
Public Health and Preventive Medicine Dept
2510 Fifth St.
Wright-Patterson AFB, OH 45433-7913

NOTICE AND SIGNATURE PAGE

Using Government drawings, specifications, or other data included in this document for any purpose other than Government procurement does not in any way obligate the U.S. Government. The fact that the Government formulated or supplied the drawings, specifications, or other data does not license the holder or any other person or corporation or convey any rights or permission to manufacture, use, or sell any patented invention that may relate to them.

Qualified requestors may obtain copies of this report from the Defense Technical Information Center (DTIC) (http://www.dtic.mil).

AFRL-SA-WP-SR-2016-0001 HAS BEEN REVIEWED AND IS APPROVED FOR PUBLICATION IN ACCORDANCE WITH ASSIGNED DISTRIBUTION STATEMENT.

//SIGNATURE//	//SIGNATURE//
_____	_____
LT COL PAULINE LUCAS	COL JAMES R. POEL
Chief, Epidemiology Consult Service	Chair, Public Health & Preventive Med Dept

This report is published in the interest of scientific and technical information exchange, and its publication does not constitute the Government's approval or disapproval of its ideas or findings.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED *(From – To)***
5 Jan 2016	Special Report	September 2014 – October 2015

4. TITLE AND SUBTITLE

DoD Global, Laboratory-Based, Influenza Surveillance Program, End-of-Year Report, 2014-2015

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Laurie DeMarcus, MPH

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
USAF School of Aerospace Medicine
Public Health and Preventive Medicine Dept/PHR
2510 Fifth St.
Wright-Patterson AFB, OH 45433-7913

8. PERFORMING ORGANIZATION REPORT NUMBER

AFRL-SA-WP-SR-2016-0001

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT

DISTRIBUTION STATEMENT A. Approved for public release.

13. SUPPLEMENTARY NOTES
Cleared, 88PA, Case # 2015-5508.

14. ABSTRACT

This is the cumulative report for specimens tested at USAFSAM during the 2014-2015 influenza season (28 September 2014 to 3 October 2015). During this period, results were finalized for 6,233 specimens from 89 locations. There were 2,058 specimens positive for influenza (four A(H1N1)pdm09, 1,792 A(H3N2), 34 B/Victoria, 83 B/Yamagata, 139 B/unknown lineage, and six influenza co-infections). Differences between specimens collected and tested are due to specimens sent for sequencing only and/or specimens not tested for various reasons. Of 6,233 influenza-like illness (ILI) cases, 2,403 are service members (38.6%), 2,395 are children (38.4%), 953 (15.3%) are spouses, and 482 (7.7%) are retirees and other beneficiaries. There are no unknown beneficiary types. The median age of ILI cases with known age (n=6,222) is 23.0 (range 0, 95) and 2,397 (38.5%) of these specimens are from ILI cases less than 18 years of age.

15. SUBJECT TERMS
Influenza, influenza-like illness, ILI, sentinel sites, influenza A, influenza B, surveillance, USAF

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			Laurie DeMarcus
U	U	U	SAR	34	**19b. TELEPHONE NUMBER *(include area code)***

This page intentionally left blank.

DoD Global, Laboratory-Based, Influenza Surveillance Program

USAF School of Aerospace Medicine

2014 - 2015

Cumulative Results

	Season
Locations	89
Collected	6,291
Tested	6,233

Influenza A	**1,801**
A(H1N1)pdm09	4
A(H3N2)	1,792
A & B	1
A & Parainfluenza	1
A(H3N2) & B/Victoria & Adenovirus & Rhino/Enterovirus	1
A(H3N2) & Coronavirus	1
A(H3N2) & Rhino/Enterovirus	1
Influenza B	**257**
B*	139
B & Rhino/Enterovirus	1
B/Victoria	34
B/Yamagata	83
Other Respiratory Pathogens	**1,173**
Adenovirus	128
Bordetella pertussis	0
Chlamydophila pneumoniae	2
Coronavirus	91
Human Metapneumovirus	71
Mycoplasma pneumoniae	48
Parainfluenza	180
RSV	208
Rhino/Enterovirus	320
Non-influenza Co-infections	125

**USAFSAM does not sequence all influenza B specimens to determine lineage.*

Lab data are current as of 26 October 2015.

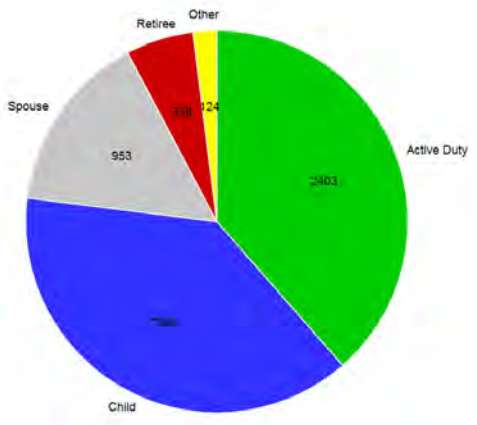
Respiratory Highlights
2014-2015 Influenza Season (28 September 2014 - 3 October 2015)

- During the 2014-2015 influenza season (28 September 2014 - 3 October 2015), results were finalized for 6,233 specimens from 89 locations. There were 2,058 specimens positive for influenza (four A(H1N1)pdm09, 1,792 A(H3N2), 34 B/Victoria, 83 B/Yamagata, 139 B/unknown lineage, and six influenza co-infections). See Table 2 on pages 5 & 6 for these results and other respiratory pathogens identified. Differences between specimens collected and tested are due to specimens sent for sequencing only and/or specimens not tested for various reasons.
- This is the cumulative report for specimens tested at USAFSAM during the 2014-2015 influenza season.

Table 1. ILI by age group for the 2014-2015 surveillance year

Age Group	Frequency	Percent
0-5	1346	21.59
6-9	463	7.43
10-17	588	9.43
18-24	920	14.76
25-44	2075	33.29
45-64	640	10.27
65+	190	3.05
Unknown	11	0.18

Graph 1. ILI by beneficiary status for the 2014-2015 surveillance year



Demographic Summary

Of 6,233 ILI cases, 2,403 are service members (38.6%), 2,395 are children (38.4%), 953 (15.3%) are spouses, and 482 (7.7%) are retirees & other beneficiaries. There are no unknown beneficiary types. The median age of ILI cases with known age (n=6,222) is 23.0 (range 0, 95) and 2,397 (38.5%) of these specimens are from ILI cases less than 18 years of age.

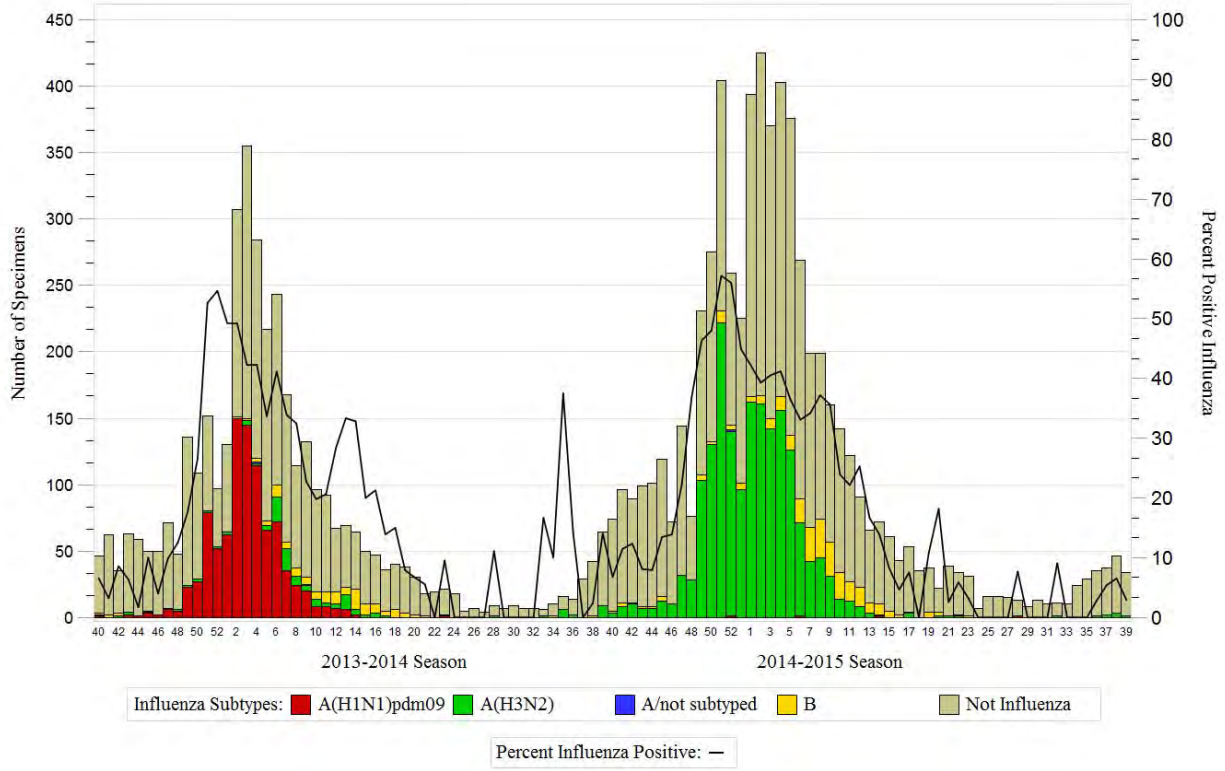
Table of Contents

Respiratory Highlights / Demographic Summary	Page 1
Cumulative Laboratory Results: Influenza & Other Respiratory Pathogens Graphs	Page 2
Vaccination Status by Beneficiary Type / Geographic Distribution of Influenza (U.S.)	Page 3
Geographic Distribution of Influenza (Pacific & CENTCOM)	Page 4
Cumulative Laboratory Results by Region and Location	Pages 5 & 6
Cumulative Non-Influenza Co-Infection Results	Page 7
EUCOM Supplemental Report: Cumulative Laboratory Results / Demographic Charts / Geographic Distribution of Influenza	Page 8 & 9
DoD Global, Laboratory-Based, Influenza Surveillance Program Background	Page 10
Attachment – Molecular Sequence Analysis: 2014-2015 Season	Pages 11-30

Cleared, 88PA, Case # 2015-5508.

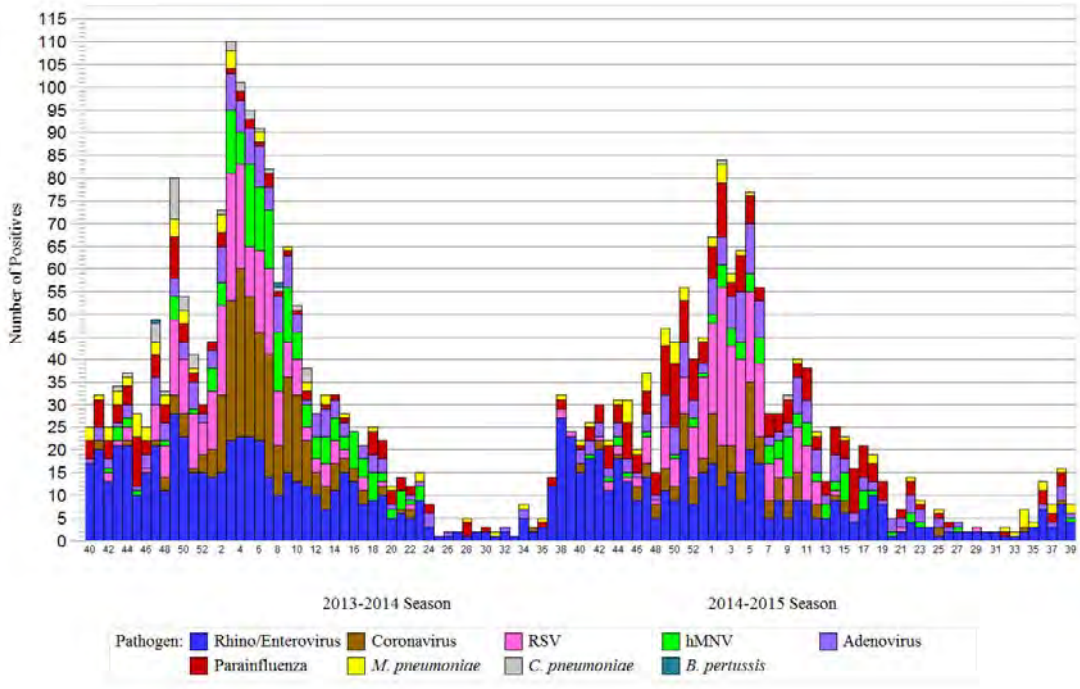
Laboratory Results - Cumulative for Season

Graph 2. Percent influenza positive by week for the 2013-2014 & 2014-2015 surveillance years



Note: One specimen positive for influenza A(H3N2)v has been excluded from the graph during the 2013-2014 season and two dual influenza co-infections have been excluded from the graph during the 2014-2015 season.

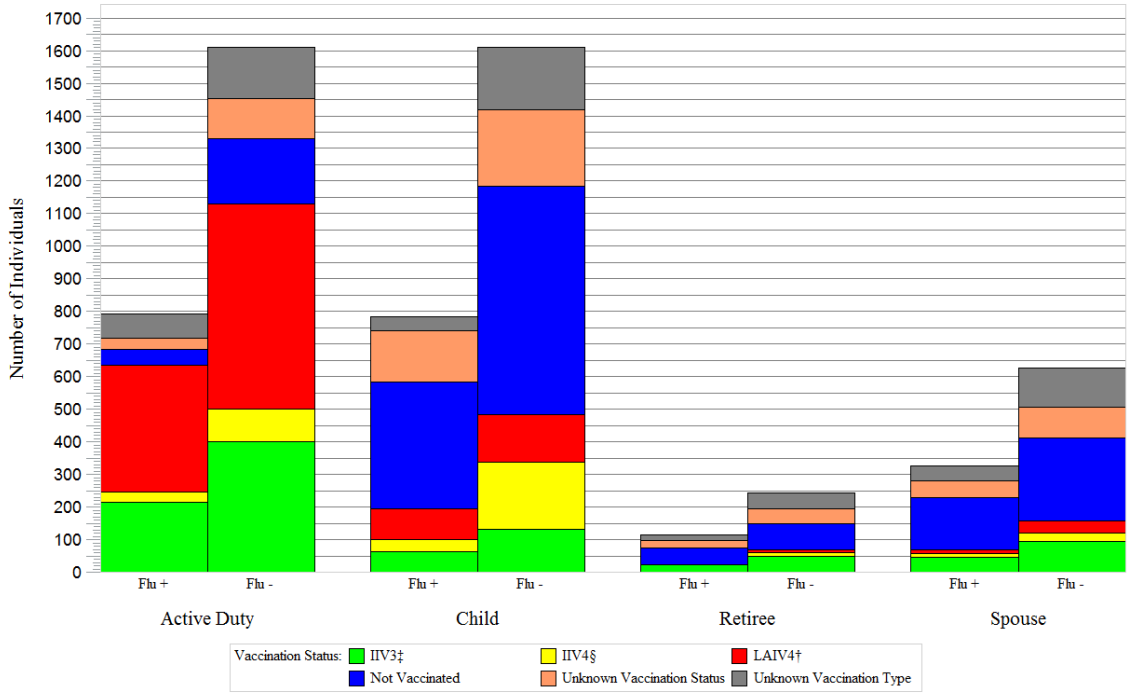
Graph 3. Other respiratory pathogen results by week for the 2013-2014 & 2014-2015 surveillance years



Note: Due to change in protocol between the surveillance years, 2013-2014 and 2014-2015, a direct comparison between the years cannot be made.

Cleared, 88PA, Case # 2015-5508.

Graph 4. Vaccination status by beneficiary type for the 2014-2015 surveillance year

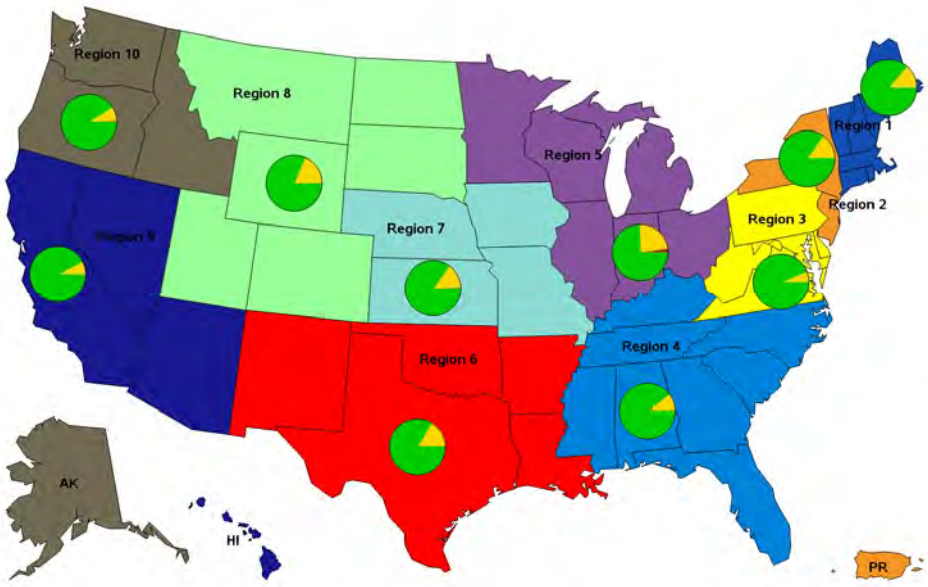


‡ Influenza Injectable Vaccine (trivalent)

§ Influenza Injectable Vaccine (quadrivalent)

† Live Attenuated Influenza Vaccine (quadrivalent)

Map 1. Influenza subtypes by Health & Human Service regions for the 2014-2015 surveillance year



Region	Flu (+)	Flu (-)	% Positive
Region 1	58	85	40.56
Region 2	228	398	36.42
Region 3	46	68	40.35
Region 4	440	889	33.11
Region 5	47	110	29.94
Region 6	306	684	30.91
Region 7	133	243	35.37
Region 8	245	373	39.64
Region 9	163	439	27.08
Region 10	153	610	20.05

Legend

Influenza A(H3N2)

Influenza A(H1N1)pdm09

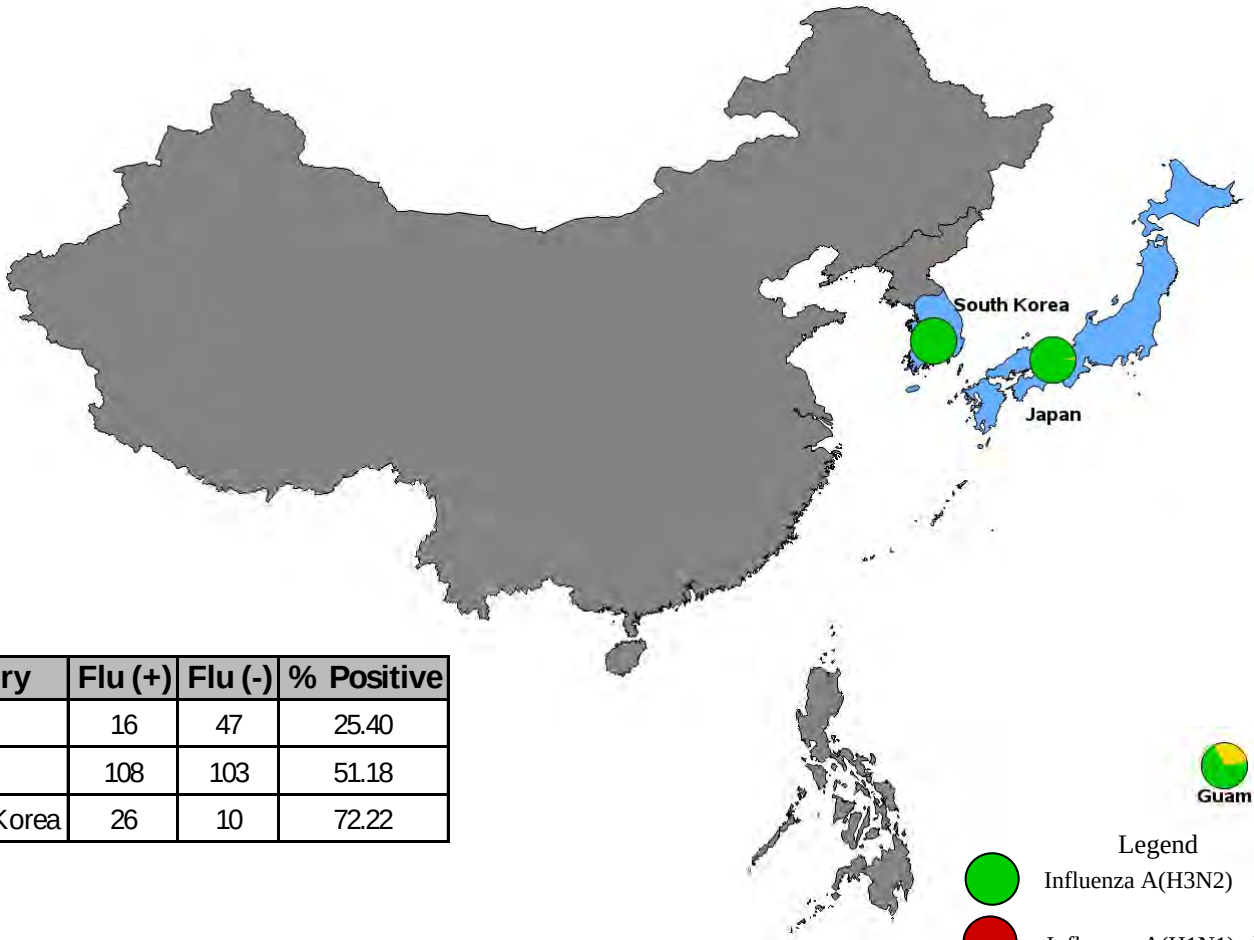
Influenza B

Influenza A/not subtyped

Cleared, 88PA, Case # 2015-5508.

DoD Global, Laboratory-Based, Influenza Surveillance Program

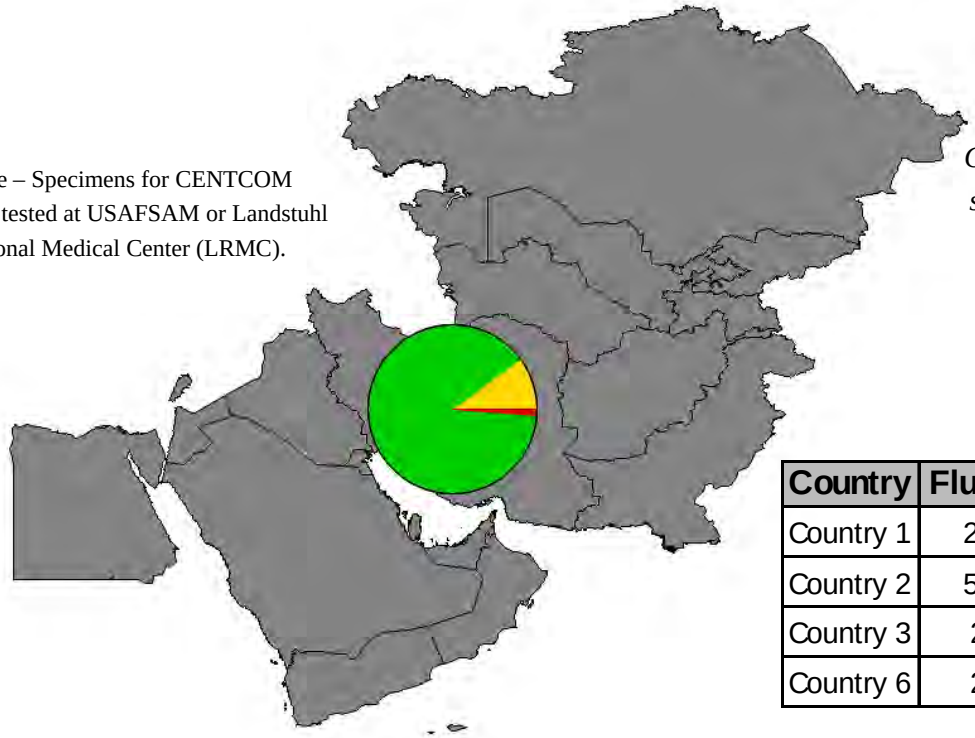
Map 2. Influenza subtypes by country for the 2014-2015 surveillance year (Pacific)



Country	Flu (+)	Flu (-)	% Positive
Guam	16	47	25.40
Japan	108	103	51.18
South Korea	26	10	72.22

Countries marked in blue contain sentinel sites (Pacific map only).

Map 3. Influenza subtypes for CENTCOM for the 2014-2015 surveillance year



*Note – Specimens for CENTCOM were tested at USAFSAM or Landstuhl Regional Medical Center (LRMC).

Country	Flu (+)	Flu (-)	% Positive
Country 1	27	80	25.23
Country 2	58	36	61.70
Country 3	2	0	100.00
Country 6	2	49	3.92

Cleared, 88PA, Case # 2015-5508.

Laboratory Results—2014-2015 surveillance year

Table 2. Cumulative results by region and location

Region*		A(H1N1)pdm09	A(H3N2)	A/not subtyped & Para	A(H3N2) & B/Victoria & Adeno & Rhino/Entero	A(H3N2) & Corona	A(H3N2) & Rhino/Entero	Influenza A & B	B	B/Victoria	B/Yamagata	B & Rhino/Entero	Adenovirus	*C. pneumoniae*	Coronavirus	hMNV	*M. pneumoniae*	Parainfluenza	RSV	Rhinovirus/Enterovirus	Non-Influenza Co-Infection	No Pathogen	Total
Deployed	Country 1, Location B	-	26	-	-	-	-	-	-	-	1	-	-	-	4	3	-	-	-	18	3	52	107
	Country 2, Location A	1	48	-	-	-	1	-	1	-	7	-	-	-	-	-	-	-	-	6	1	29	94
	Country 3, Location A	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
PACOM	CFA Okinawa, Japan	-	4	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	2	-	20	28
	Camp Zama, Japan	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
	Eielson AFB, AK	-	6	-	-	-	-	-	1	-	-	-	3	-	-	-	-	-	-	2	-	9	21
	JB Elmendorf-Richardson, AK	-	7	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	5	14
	JR Marianas - Andersen AFB, Guam	-	11	-	-	-	-	-	1	-	4	-	6	-	-	3	-	1	3	5	1	27	62
	JR Marianas - NH Guam, Guam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	Kadena AB, Japan	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	11	19
	Kunsan AB, South Korea	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	12
	Misawa AB, Japan	-	10	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	-	14	27
	Osan AB, South Korea	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	8	24
	Tripler AMC, HI	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
	Yokota AB, Japan	-	81	-	-	-	-	-	-	-	2	-	2	-	2	4	-	1	1	5	1	32	131
Region 1	Hanscom AFB, MA	-	24	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	3	1	-	30	59
	NHCNE Newport, RI	-	16	-	-	-	-	-	1	2	3	-	2	-	-	-	-	1	2	1	2	23	53
	USCG Academy, CT	-	10	-	-	-	-	-	1	-	-	-	1	-	-	-	1	1	-	2	1	14	31
Region 2	CGAS Borinquen, PR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	Ft Drum, NY	-	64	-	-	-	-	-	13	-	9	-	5	-	5	5	1	4	10	19	10	59	204
	JB McGuire-Dix-Lakehurst, NJ	-	32	-	-	1	-	-	-	-	2	-	-	-	-	-	-	-	2	6	1	34	78
	USMA - West Point, NY	1	96	-	-	-	-	-	8	-	2	-	6	-	9	2	5	8	12	11	8	175	343
Region 3	CG Base Portsmouth, VA	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
	Dover AFB, DE	-	21	-	-	-	-	-	-	-	1	-	-	-	1	1	1	1	-	-	-	20	46
	JB Anacostia-Bolling, DC	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	5
	JB Andrews, MD	-	4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	2	-	4	12
	JB Langley-Eustis, VA	-	7	-	-	-	-	-	-	-	-	-	2	-	-	-	-	2	-	-	1	13	25
	NCRM - Ft Belvoir CH, VA	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	4	1	4	11
	NCRM - Walter Reed NMMC, MD	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	4
	NMC Portsmouth, VA	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	5	6
Region 4	CGS Mobile, AL	-	11	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	-	9	23
	Columbus AFB, MS	-	7	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	20	29
	Eglin AFB, FL	-	14	-	-	-	-	-	3	-	2	-	3	-	-	1	1	4	6	4	7	66	111
	Ft Bragg, NC	-	30	-	-	-	-	-	-	-	-	-	2	-	3	2	-	2	7	3	2	36	87
	Ft Campbell, KY	-	30	-	-	-	-	-	1	1	-	-	5	-	1	1	-	4	2	6	3	37	91
	Hurlburt Field, FL	-	22	-	-	-	-	-	1	-	-	-	3	-	-	-	2	1	4	9	2	41	85
	JB Charleston (AF), SC	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	14
	JB Charleston (Navy), SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	-	2	5
	Keesler AFB, MS	-	6	-	-	-	-	-	-	1	1	-	7	-	1	-	6	1	2	6	2	80	113
	MacDill AFB, FL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	13
	Maxwell AFB, AL	-	31	-	-	-	-	-	10	-	5	-	2	-	2	1	1	2	1	6	-	80	141
	Moody AFB, GA	-	92	-	-	-	-	-	5	3	3	-	16	-	8	10	1	17	5	22	11	109	302
	NH Beaufort, SC	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	2	1	18	24
	NH Camp Lejeune, NC	-	61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	12	77
	NH Jacksonville, FL	-	1	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	4	1	-	8
	Patrick AFB, FL	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	3	4
	Robins AFB, GA	-	35	-	-	-	-	-	3	-	2	-	1	-	3	1	-	-	-	-	-	43	88
	Seymour Johnson AFB, NC	-	15	-	-	-	-	-	-	-	-	-	2	-	-	1	-	1	3	5	-	13	40
	Shaw AFB, SC	-	7	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1	2	-	13	25
	Tyndall AFB, FL	-	14	-	-	-	-	-	-	-	3	-	4	-	1	1	-	1	2	1	1	17	45
	USCG Base Elizabeth City, NC	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4

**CONUS locations are based on Health & Human Services regions. Other locations are defined by COCOM.*

*** Refer to Table 3 for more detailed information on non-influenza co-infections.*

Continued on page 6

Cleared, 88PA, Case # 2015-5508.

Laboratory Results—2014-2015 surveillance year

Table 2. Cumulative results by region and location (continued from page 5)

Region*		A(H1N1)pdm09	A(H3N2)	A/not subtyped & Para	A(H3N2) & B/Victoria & Adeno & Rhino/Entero	A(H3N2) & Corona	A(H3N2) & Rhino/Entero	Influenza A & B	B	B/Victoria	B/Yamagata	B & Rhino/Entero	Adenovirus	*C. pneumoniae*	Coronavirus	hMNV	*M. pneumoniae*	Parainfluenza	RSV	Rhinovirus/Enterovirus	Non-Influenza Co-Infection	No Pathogen	Total
Region 5	Scott AFB, IL	-	23	-	-	-	-	-	6	1	4	-	2	-	1	1	-	3	2	2	-	39	84
	Wright-Patterson AFB, OH	1	12	-	-	-	-	-	-	-	-	-	-	-	4	1	-	-	4	9	-	42	73
Region 6	Altus AFB, OK	-	16	-	-	-	-	-	4	-	2	1	3	-	1	-	-	6	7	4	2	118	164
	Barksdale AFB, LA	-	10	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	1	11	24
	Cannon AFB, NM	-	4	-	-	-	-	-	1	-	-	-	-	-	1	-	-	1	1	3	-	16	27
	Ft Hood, TX	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	Holloman AFB, NM	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5
	Laughlin AFB, TX	-	9	-	-	-	-	-	-	-	-	-	3	-	1	-	2	2	3	7	3	17	47
	Little Rock AFB, AR	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	34	53
	SAMMC, TX	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
	Sheppard AFB, TX	-	69	-	-	-	-	-	4	3	1	-	3	-	6	3	3	6	5	6	7	121	237
	Tinker AFB, OK	-	123	-	1	-	-	-	26	6	1	-	2	1	5	7	3	13	22	16	8	191	425
	USCG New Orleans, LA	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Vance AFB, OK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2	3
Region 7	Ft Leavenworth, KS	-	5	-	-	-	-	-	-	-	-	-	2	-	1	1	-	-	1	1	-	13	24
	McConnell AFB, KS	-	38	1	-	-	-	1	2	-	2	-	-	-	3	-	-	1	-	4	-	28	80
	Offutt AFB, NE	-	70	-	-	-	-	-	9	-	6	-	3	-	5	-	2	8	1	12	1	156	273
Region 8	Buckley AFB, CO	-	2	-	-	-	-	-	1	2	-	-	-	-	1	-	-	-	1	1	-	9	17
	Ellsworth AFB, SD	-	30	-	-	-	-	-	12	2	4	-	2	-	5	1	4	7	1	5	2	47	122
	FE Warren AFB, WY	-	35	-	-	-	-	-	8	4	-	-	3	-	-	-	-	15	3	3	2	40	113
	Hill AFB, UT	-	34	-	-	-	-	-	-	-	2	-	-	-	-	-	2	4	4	8	2	42	98
	Malmstrom AFB, MT	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	-	2	10
	Minot AFB, ND	-	19	-	-	-	-	-	1	-	-	-	2	-	3	1	3	5	11	4	3	30	82
	Peterson AFB, CO	-	50	-	-	-	-	-	1	2	3	-	-	-	-	1	1	4	3	4	2	41	112
	USAF Academy, CO	-	26	-	-	-	-	-	2	1	-	-	-	-	-	-	1	1	-	2	-	31	64
Region 9	Beale AFB, CA	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	Davis-Monthan AFB, AZ	-	26	-	-	-	-	-	-	-	2	-	2	-	2	4	-	3	1	2	1	48	91
	Edwards AFB, CA	-	8	-	-	-	-	-	1	1	1	-	-	-	-	-	-	3	-	-	-	16	30
	Los Angeles AFB, CA	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Luke AFB, AZ	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	15	29
	Nellis AFB, NV	-	19	-	-	-	-	-	1	2	2	-	2	-	-	-	-	-	2	2	-	31	61
	Travis AFB, CA	-	56	-	-	-	-	-	1	1	-	-	1	-	2	2	2	12	18	14	3	216	328
	USCG Island Alameda, CA	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	8
	Vandenberg AFB, CA	-	6	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3	-	26	36
Region 10	CGS North Bend, OR	-	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	1	5
	Fairchild AFB, WA	-	22	-	-	-	-	-	1	-	1	-	1	-	2	2	-	1	7	1	1	11	50
	Mt Home AFB, ID	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	-	-	9	23
	NH Bremerton, WA	1	92	-	-	-	-	-	7	-	2	-	18	1	5	7	5	25	39	40	21	387	650
Total		4	1792	1	1	1	1	1	139	34	83	1	128	2	91	71	48	180	208	320	125	3002	6233

**CONUS locations are based on Health & Human Services regions. Other locations are defined by COCOM.*

*** Refer to Table 3 for more detailed information on non-influenza co-infections.*

Cleared, 88PA, Case # 2015-5508.

Laboratory Results—2014-2015 surveillance year

Table 3. Cumulative non-influenza co-infection results by region and location

Region*		Adeno & Corona	Adeno & Corona & Rhino/Entero	Adeno & Corona & Para & Rhino/Entero	Adeno & hMNV	Adeno & Para	Adeno & Para & RSV & Rhino/Entero	Adeno & RSV	Adeno & RSV & Rhino/Entero	Adeno & Rhino/Entero	Corona & hMNV	Corona & Para	Corona & RSV	Corona & RSV & Rhino/Entero	Corona & Rhino/Entero	hMNV & RSV	hMNV & Rhino/Entero	*M. pneumo* & Para	*M. pneumo* & RSV & Rhino/Entero	*M. pneumo* & Rhino/Entero	Para & RSV	Para & RSV & Rhino/Entero	Para & Rhino/Entero	RSV & Rhino/Entero	Total
Deployed	Country 1, Location B	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	1	3
	Country 2, Location A	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
PACOM	JR Marianas - Andersen AFB, Guam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	Kadena AB, Japan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
	Osan AB, South Korea	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Yokota AB, Japan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Region 1	NHCNE Newport, RI	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2
	USCG Academy, CT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Region 2	Ft Drum, NY	-	-	-	-	-	-	-	-	6	1	-	-	-	-	-	-	-	-	-	-	-	-	3	10
	JB McGuire-Dix-Lakehurst, NJ	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	USMA - West Point, NY	-	-	-	-	-	-	1	-	2	-	1	-	-	1	-	-	-	-	-	-	1	2	-	8
Region 3	JB Langley-Eustis, VA	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	NCRM - Ft Belvoir CH, VA	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
	NCRM - Walter Reed NMMC, MD	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Region 4	Eglin AFB, FL	1	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	1	7
	Ft Bragg, NC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	2
	Ft Campbell, KY	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	3
	Hurlburt Field, FL	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	Keesler AFB, MS	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	Moody AFB, GA	-	-	-	-	-	-	-	-	3	-	-	-	-	1	-	1	-	-	2	-	-	2	2	11
	NH Beaufort, SC	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	NH Camp Lejeune, NC	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	3
	NH Jacksonville, FL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
	Tyndall AFB, FL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Region 6	Altus AFB, OK	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	Barksdale AFB, LA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	Laughlin AFB, TX	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	1	-	3
	Sheppard AFB, TX	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	1	-	-	-	-	-	1	2	7
	Tinker AFB, OK	-	-	-	1	1	-	-	-	1	-	-	-	-	-	1	2	-	-	-	-	-	-	2	8
Region 7	Offutt AFB, NE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Region 8	Ellsworth AFB, SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	2
	FE Warren AFB, WY	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	2
	Hill AFB, UT	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	2
	Minot AFB, ND	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	3
	Peterson AFB, CO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	2
Region 9	Davis-Monthan AFB, AZ	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Travis AFB, CA	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	1	-	3
Region 10	Fairchild AFB, WA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
	NH Bremerton, WA	-	-	-	-	-	-	-	-	3	1	1	2	-	1	-	4	-	1	2	1	-	2	3	21
Total		1	3	1	1	2	1	2	1	26	2	3	10	1	9	1	9	1	1	9	3	2	14	22	125

**CONUS locations are based on Health & Human Services regions. Other locations are defined by COCOM.*

Cleared, 88PA, Case # 2015-5508.

EUCOM Respiratory Surveillance Supplemental Report Through 2014-2015

- In cooperation and agreement with U.S. Army Public Health Command Region-Europe (PHCR-E), the DoD Global, Laboratory-based, Influenza Surveillance Program has analyzed data from surveillance sites that submit specimens to Landstuhl Regional Medical Center (LRMC), Germany. LRMC's laboratory is the forward laboratory for military sites in Europe.

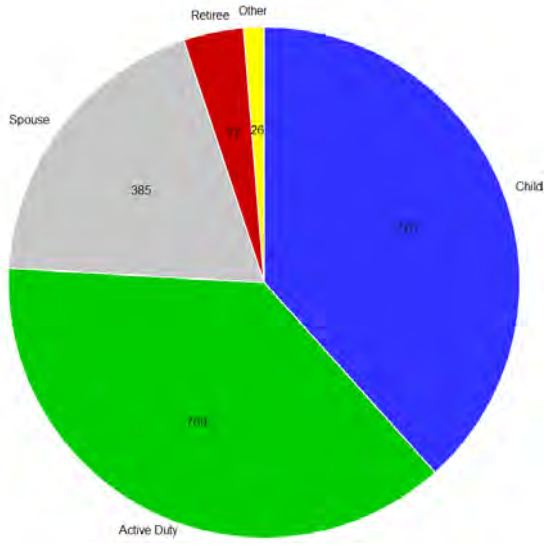
Table 4. Cumulative results by region and location for specimens collected during the 2014-2015 surveillance year

Region		A(H1N1)pdm09	A(H3N2)	A/not subtyped	A/not subtyped & RSV	A/not subtyped & Rhino/Entero	A(H1N1)pdm09 & hMNV	A(H1N1)pdm09 & RSV	A(H3N2) & B	A(H3N2) & hMNV	A(H3N2) & hMNV & Rhino/Entero	A(H3N2) & Para	A(H3N2) & RSV	A(H3N2) & RSV & Rhino/Entero	A(H3N2) & Rhino/Entero	Influenza A & B	B	B & RSV	B & Rhino/Entero	Adenovirus	hMNV	Parainfluenza	RSV	Rhinovirus/Enterovirus	Adeno & RSV	Adeno & RSV & Rhino/Entero	Adeno & Rhino/Entero	hMNV & RSV	hMNV & Rhino/Entero	Para & RSV	Para & Rhino/Entero	RSV & Rhino/Entero	No Pathogen	Total
Deployed	Country 6, Location A	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	40	50
EUCOM	Aviano AB, Italy	4	12	2	-	-	-	-	2	-	-	-	-	-	-	-	3	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	19	44
	Incirlik AB, Turkey	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	1	2	6	2	6	-	-	1	-	-	-	-	-	17	37
	Landstuhl RMC, Germany	5	108	11	-	1	1	-	-	-	-	-	2	-	-	2	10	-	-	1	7	10	46	46	2	1	6	2	-	1	2	7	195	466
	NAS Sigonella, Italy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	2
	NAVSTA Rota, Spain	3	15	-	1	-	-	-	-	-	-	-	-	-	-	-	4	-	1	1	2	-	2	5	-	-	1	-	-	-	-	1	34	70
	NSA Naples, Italy	10	10	1	-	-	-	1	-	-	-	-	-	-	-	-	3	-	1	-	1	1	8	11	-	-	-	-	-	-	-	2	28	77
	RAF Lakenheath, England	5	132	3	-	3	-	-	-	-	-	1	3	-	9	-	11	1	-	2	8	9	12	58	-	-	1	-	1	1	3	9	167	439
	Ramstein AB, Germany	1	59	1	-	1	-	-	-	-	-	-	-	-	2	-	2	-	1	-	4	2	17	18	-	-	1	-	-	-	2	1	29	141
	Spangdahlem AB, Germany	1	21	1	1	-	-	-	-	-	1	-	1	-	2	-	1	-	-	1	4	5	13	6	-	-	1	-	-	-	-	3	35	97
	USAG Stuttgart, Germany	1	61	7	-	-	-	-	1	-	-	-	1	-	2	-	8	-	-	1	4	7	8	24	-	-	-	-	-	-	-	1	80	206
	USAG Vicenza, Italy	6	51	2	-	-	-	-	-	1	-	-	-	-	4	-	-	-	1	-	3	2	-	24	-	-	-	-	-	-	-	-	59	153
	Vilseck AHC, Germany	1	95	4	-	1	-	2	-	-	-	-	4	2	3	-	6	-	2	3	1	4	21	35	-	-	2	-	2	-	-	4	50	242
Total		37	566	32	2	6	1	3	3	1	1	1	12	2	23	2	48	1	6	10	36	46	129	244	2	1	13	2	3	2	7	28	754	2024

Table 5. ILI by age group for the 2014-2015 surveillance year

Age Group	Frequency	Percent
0-5	529	26.14
6-9	124	6.13
10-17	123	6.08
18-24	257	12.7
25-44	782	38.64
45-64	172	8.5
65+	37	1.83

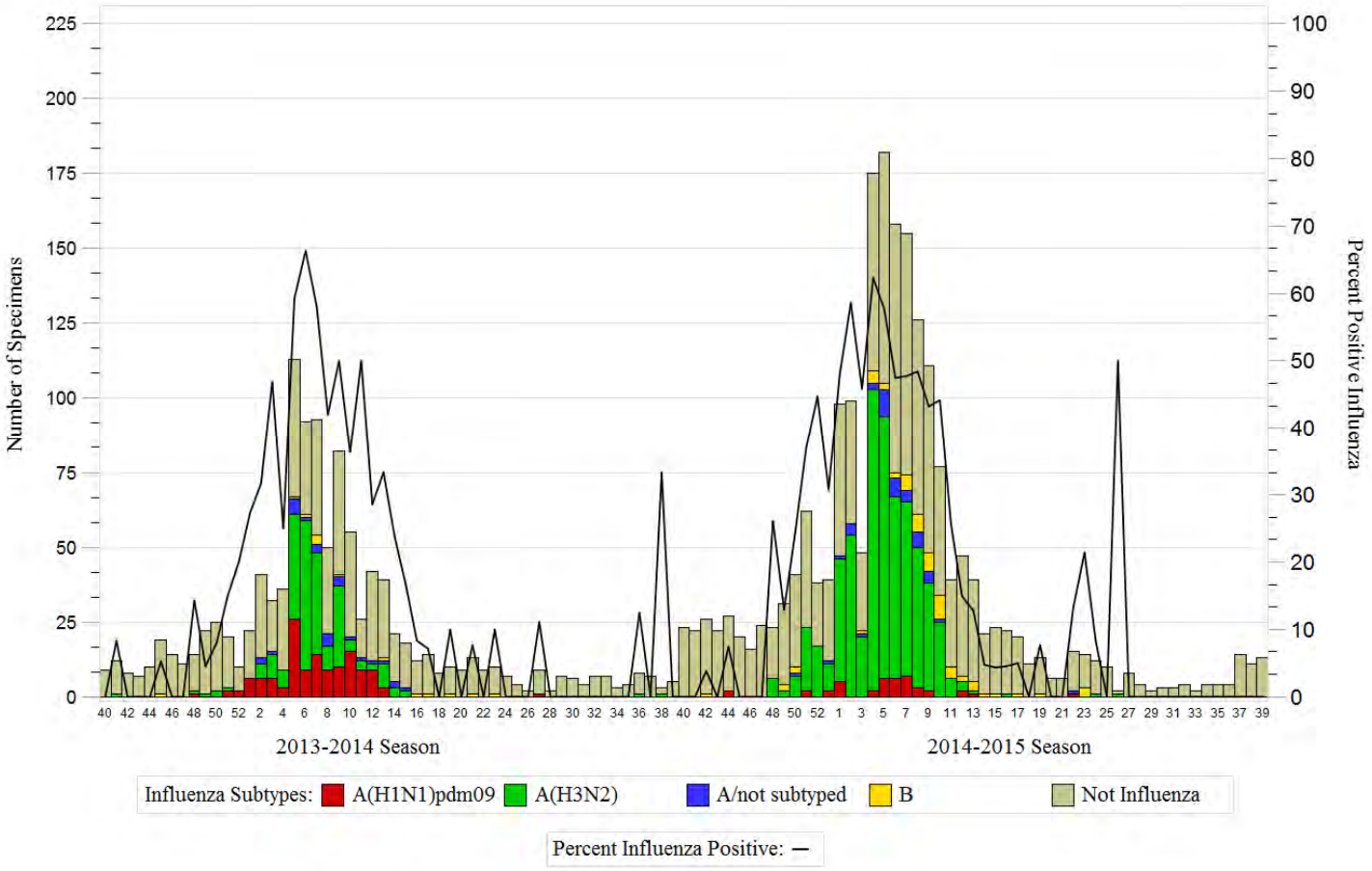
Graph 5. ILI by beneficiary status for the 2014-2015 surveillance year



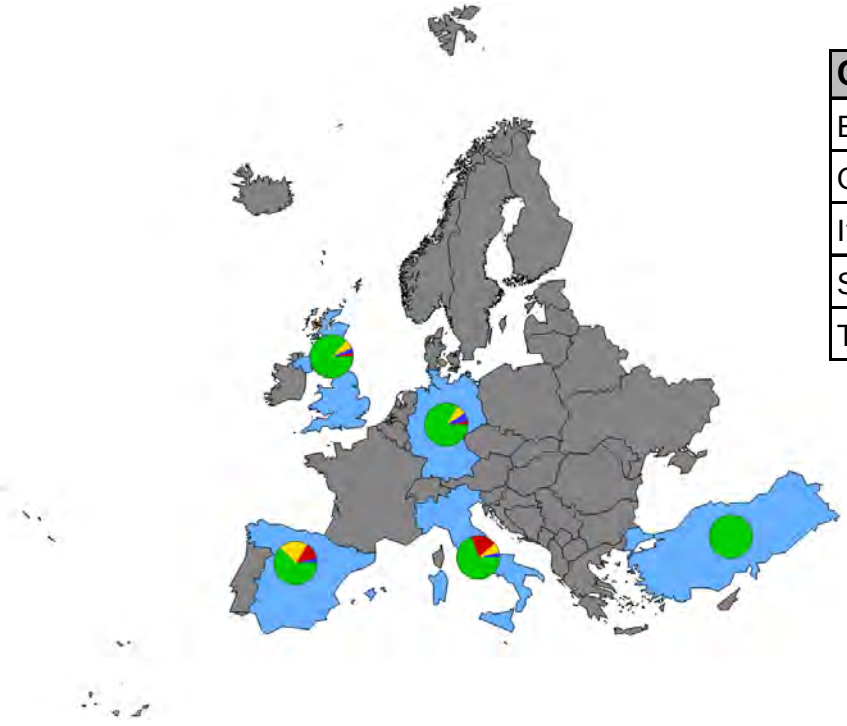
Cleared, 88PA, Case # 2015-5508.

DoD Global, Laboratory-Based, Influenza Surveillance Program

Graph 6. Percent influenza positive by week for the 2013-2014 & 2014-2015 surveillance years (Europe)



Map 4. Percentage of influenza positive by country for the 2014-2015 surveillance year (Europe)



Country	Flu (+)	Flu (-)	% Positive
England	168	271	38.27
Germany	434	715	37.77
Italy	112	162	40.88
Spain	24	46	34.29
Turkey	2	35	5.41

Legend
- Influenza A(H3N2)
- Influenza A(H1N1)pdm09
- Influenza B
- Influenza A/not subtyped

Countries marked in blue contain sentinel sites

DoD Global, Laboratory-Based, Influenza Surveillance Program

USAF School of Aerospace Medicine

2014 - 2015

Respiratory Surveillance
2014-2015 Year
(beginning 28 September 2014)

USAF School of Aerospace Medicine

2510 5th Street, Bldg 20840
Wright-Patterson AFB, OH
45433-7913

For Public Health Services
937-938-3196; DSN 798-3196

For Laboratory Services
937-938-3163; DSN 798-3163

E-mail
USAFSAM.PHRFlu@us.af.mil

Contributions to the CDC for National Influenza Surveillance

All sequence data are sent to the CDC and selected original specimens or isolates are sent for further characterization and possible use as influenza vaccine seed viruses. Specimens may also undergo antiviral testing.

DoD Global Influenza Surveillance Program
https://gumbo2.wpafb.af.mil/epi-consult/index.cfm

Background

The DoD-wide program was established by the Global Emerging Infections Surveillance and Response System (GEIS) in 1997. The surveillance network includes the US Air Force School of Aerospace Medicine (USAFSAM) (sentinel site respiratory surveillance), the Naval Health Research Center (recruit and shipboard population-based respiratory surveillance), the Naval Medical Research Unit (NAMRU-3) in Cairo, Egypt, the Naval Medical Research Unit (NAMRU-2) in Phnom Penh, Cambodia, the Armed Forces Research Institute of Medical Sciences (AFRIMS) in Bangkok, Thailand, the Naval Medical Research Unit-6 (NAMRU-6) in Lima, Peru, and the United States Army Medical Research Unit-Kenya (USAMRU-K) located in Nairobi, Kenya. This work is supported by the Air Force and the Division of Global Emerging Infections Surveillance and Response System (GEIS) Operations, a Division of the Armed Forces Health Surveillance Center (AFHSC).

Sentinel Site Surveillance at USAFSAM

In 1976, the US Air Force Medical Service began conducting routine, global, laboratory-based influenza surveillance. Air Force efforts expanded to DoD-wide in 1997. USAFSAM manages the surveillance program that includes global surveillance among DoD beneficiaries at over 90 sentinel sites (including deployed locations) and many non-sentinel sites (please see map on the left). Unique sentinel sites include three DoD overseas medical research laboratories (AFRIMS, NAMRU-6, USAMRU-K) and the US Army Public Health Command Region South (PHCR-S). These sites collect specimens from local residents in surrounding countries that may not otherwise be covered in existing surveillance efforts.

Since the 2006-2007 season, Landstuhl Regional Medical Center (LRMC) has served EUCOM as a USAFSAM contributing laboratory. The initiative seeks to provide more timely results and efficient transport of specimens.

For an expanded view of this report, visit our website. Also available on the website is a list of previous weekly surveillance reports, program information (including an educational briefing and instruction pamphlets for clinic staff), and an overview of historical data. Please visit the AFHSC/GEIS website for an overview of influenza surveillance at all collaborating organizations.

Errata:

Collaborating Partners

In addition to all participating DoD military sentinel sites, several collaborating partners (described above) may be further understood by reviewing the partner's website.

Cleared, 88PA, Case # 2015-5508.

DoD Global, Laboratory-Based, Influenza Surveillance Program

Attachment - Molecular Sequence Analysis: 2014-2015 Season
USAFSAM Epidemiology Laboratory Service

This is a cumulative report for samples received at USAFSAM during the 2014-2015 season. Of the 1,006 total specimens and sequences collected and analyzed by USAFSAM between 4 September 2014 and 5 June 2015, 862 (86%) were influenza A(H3N2) viruses, 10 (1%) were influenza A(H1N1)pdm09 viruses, 94 (9%) were influenza B/Yamagata viruses, and 40 (4%) were influenza B/Victoria virus specimens.

CONUS	A(H3N2)	A(H1N1)pdm09	B/Yamagata	B/Victoria
Alabama, CGS Mobile	6		1	
Alabama, Maxwell AFB	13		5	
Arizona, Davis-Monthan AFB	8		2	
Arizona, Luke AFB	2			
Arkansas, Little Rock AFB	4			
California, Beale AFB	1			
California, Edwards AFB	5		1	1
California, NHRC	9			1
California, Travis AFB	19			1
California, USCG Island Alameda	1			
California, Vandenberg AFB	2			
Colorado, Buckley AFB	1			2
Colorado, Peterson AFB	20		3	2
Colorado, USAF Academy	13			1
Connecticut, USCG Academy	4			
Delaware, Dover AFB	11		1	
District of Columbia, JB Anacostia-Bolling	2			
Florida, Eglin AFB	7		2	
Florida, Hurlburt Field	8			
Florida, NH Jacksonville	1			
Florida, Tyndall AFB	8		3	
Georgia, Moody AFB	53		3	3
Georgia, Robins AFB	25		2	
Idaho, Mt Home AFB	4			
Illinois, NHRC	4			
Illinois, Scott AFB	7		4	1
Kansas, Ft Leavenworth	1			
Kansas, McConnell AFB	10		2	
Kentucky, Ft Campbell	13			1
Louisiana, Barksdale AFB	5			1
Louisiana, USCG New Orleans	1			
Maryland, JB Andrews	4			
Maryland, NCRM – Walter Reed NMMC	2			
Massachusetts, Hanscom AFB	9		1	
Mississippi, Columbus AFB	3			
Mississippi, Keesler AFB	4		1	1
Montana, Malmstrom AFB	1			
Nebraska, Offutt AFB	31		6	
Nevada, Nellis AFB	10		2	2
New Jersey, JB McGuire-Dix-Lakehurst	10		2	
New Mexico, Cannon AFB	1			
New Mexico, Holloman AFB	1			
New York, Ft Drum	19		9	
New York, USMA – West Point	26	1	2	
North Carolina, Ft Bragg	17			
North Carolina, NH Camp Lejeune	45			
North Carolina, Seymour Johnson AFB	8			
North Carolina, USCG Base Elizabeth City	1			
North Dakota, Minot AFB	6			
Ohio, Wright-Patterson AFB	1			
Oklahoma, Altus AFB	2		2	
Oklahoma, Tinker AFB	44		1	7
Oregon, CGS North Bend	1			
Rhode Island, NHCNE Newport	7		3	2
South Carolina, JB Charleston (AF)	5			
South Carolina, NH Beaufort	1			
South Carolina, Shaw AFB	4			
South Dakota, Ellsworth AFB	12		4	2
Texas, Ft Hood	1			
Texas, Laughlin AFB	2			
Texas, SAMMC	1		1	1
Texas, Sheppard AFB	33		1	3
Utah, Hill AFB	15		2	
Virginia, CG Base Portsmouth	3			
Virginia, JB Langley-Eustis	5			
Virginia, NMC Portsmouth	1			1
Washington, Fairchild AFB	6		1	
Washington, NH Bremerton	44		2	
Wyoming, FE Warren AFB	8			4
CONUS Total	**662**	**1**	**69**	**37**

OCONUS	A(H3N2)	A(H1N1)pdm09	B/Yamagata	B/Victoria
Belgium, Shape AHC	2			
Alaska, Eielson AFB	4			
Alaska, JB Elmendorf-Richardson	6		1	
Country 1, Location B	22		1	
Country 2, Location A	19	1	7	
Country 3, Location A	1			
England, RAF Lakenheath	1		1	
Germany, Kaiserslautern AHC	1			
Germany, Landstuhl RMC (ALL)	42	1	3	
Germany, Patch AHC	2		1	
Germany, Ramstein AB	1			
Germany, Spangdahlem AB	1			
Guam, JR Marianas-Andersen AFB	6		4	
Hawaii, Tripler AMC	10		1	
Indonesia, AFRIMS	3	1	1	
Italy, Aviano AB			1	
Italy, USAG Vicenza	6	5	1	
Japan, Camp Zama	4			
Japan, CFA Okinawa	3			
Japan, Kadena AB	4			
Japan, Misawa AB	5			
Japan, Yokota AB	38		2	
Pakistan, AFRIMS			1	
Singapore, NHRC	2			
South Korea, Kunsan AB	4			
South Korea, Osan AB	9			
Thailand, AFRIMS	4	1		3
OCONUS Total	**200**	**9**	**25**	**3**

	A(H3N2)	A(H1N1)pdm09	B/Yamagata	B/Victoria
CONUS & OCONUS TOTAL	**862**	**10**	**94**	**40**

The hemagglutinin (HA) gene from select influenza positives was sequenced using dye terminator, Sanger-based methods. Preliminary data are based on the sequence analysis of the hemagglutinin gene. Antigenic sites, receptor binding sites and glycosylation motifs are predicated upon correlations with previously published experimental evidence.[1,3,4] Sequence data was constructed and analyzed using multiple software programs. Genetic and predicted antigenic information that resulted from this analysis is shared with United States Centers for Disease Control and Prevention (CDC), World Health Organization (WHO) and potentially contributes to the seasonal Northern and Southern Hemisphere vaccine component selections.

Cleared, 88PA, Case # 2015-5508.

Influenza A(H3N2)

- Isolates are characterized in a neighbor-joining phylogenetic tree with reference strains rooted from the previous vaccine, A/Victoria/361/2011 [Figure 1].

- The influenza A(H3N2) specimens characterized for this report exhibited an overall protein identity of 96.9-99.1% as compared to the influenza A(H3N2) component of the 2013-2014 vaccine formulation, A/Texas/50/2012-like virus.

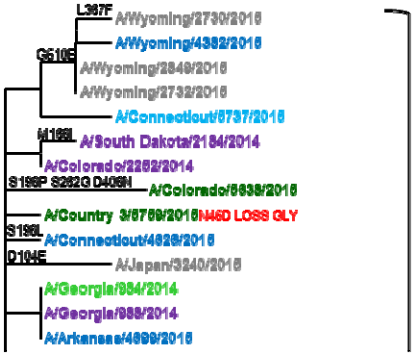
- Based on the mutations observed in reference to the root strain, A/Victoria/361/2011, all of the influenza A(H3N2) viruses analyzed belong to clade 3C, with 79% further classifying as 3C.2a and 21% further classifying as 3C.3 (6% 3C.3a).

- Gain or loss of *N*-linked glycosylation sites has been shown to alter HA protein surface topology. A gain in glycosylation could be advantageous to the virus by virtue of a masking effect on important antibody recognition sites, thus potentially modulating viral antigenicity.[4] Observations are based solely on sequence motifs. For the influenza A(H3N2) specimens characterized in this report, 26 mutations were observed that could cause a loss of a glycosylation motif: N8D (asparagine to aspartic acid), T10A (threonine to alanine), T24M (threonine to methionine), N45D (asparagine to aspartic acid), N122D (asparagine to aspartic acid), S124G (serine to glycine), S124N (serine to asparagine), T128A (threonine to alanine), N133D (asparagine to aspartic acid), T135K (threonine to lysine), N144S (asparagine to serine), N158D (asparagine to aspartic acid), N158H (asparagine to histidine), N158K (asparagine to lysine), N158S (asparagine to serine),T160K (threonine to lysine), T160I (threonine to isoleucine), T160R (threonine to arginine), T160A (threonine to alanine), N246Y (asparagine to tyrosine), N246S (asparagine to serine), N246H (asparagine to histidine), T248A (threonine to alanine), T248I (threonine to isoleucine), T248K (threonine to lysine), and T485I (threonine to isoleucine). Three mutations, S144N (serine to asparagine), K160T (lysine to threonine), and I300T (isoleucine to threonine), were observed that could cause a gain of a glycosylation motif.

- Of the 163 mutations present in the influenza A(H3N2) specimens, 38 occurred at predicted antigenic sites and seven at the receptor binding site.[2,5]

USAFSAM 2014-2015 Season Cumulative Influenza A(H3N2) HA Phylogenetic Analysis
Figure 1

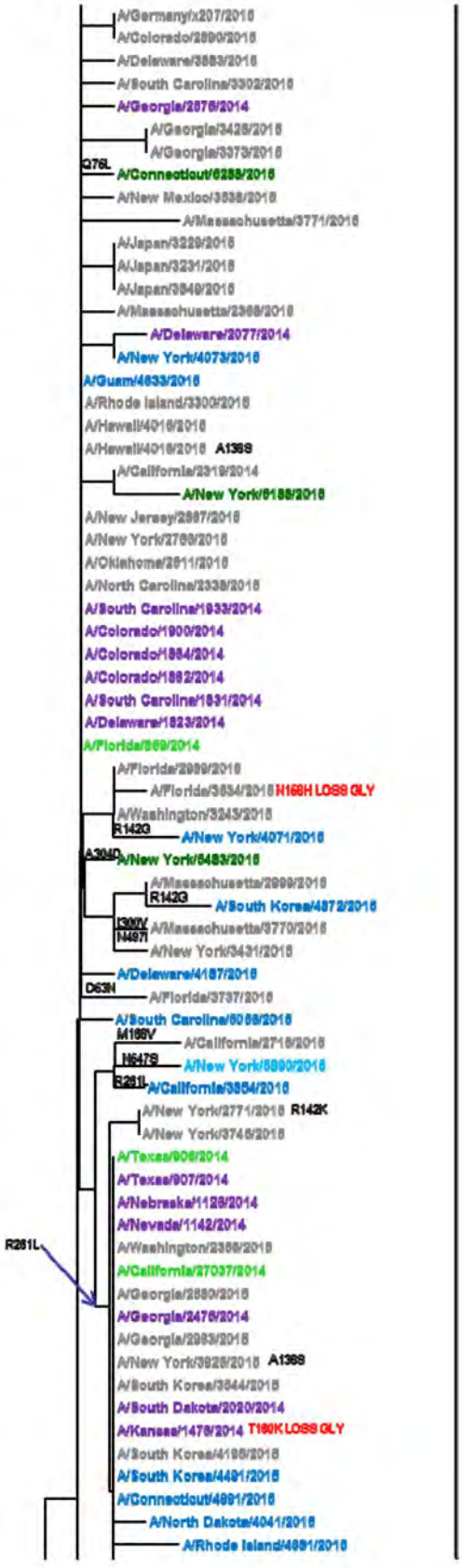
2014-2015 A(H3N2) Vaccine strain:
A/Texas/50/2012
2015-2016 A(H3N2) Vaccine strain:
A/Switzerland/9715293/2013
Reference Strain
September 2014
October 2014
November 2014
December 2014
January 2015
February 2015
March 2015
April 2015
May 2015
ADD GLY **Create Glycosylation Motif**
LOSS GLY **Loss of Glycosylation Motif**
F CDC Reference Antigen
e Egg Isolate
LR Low Reactor to : A/Texas/50/2012 (≥8 fold)



3C.2a

Cleared, 88PA, Case # 2015-5508.

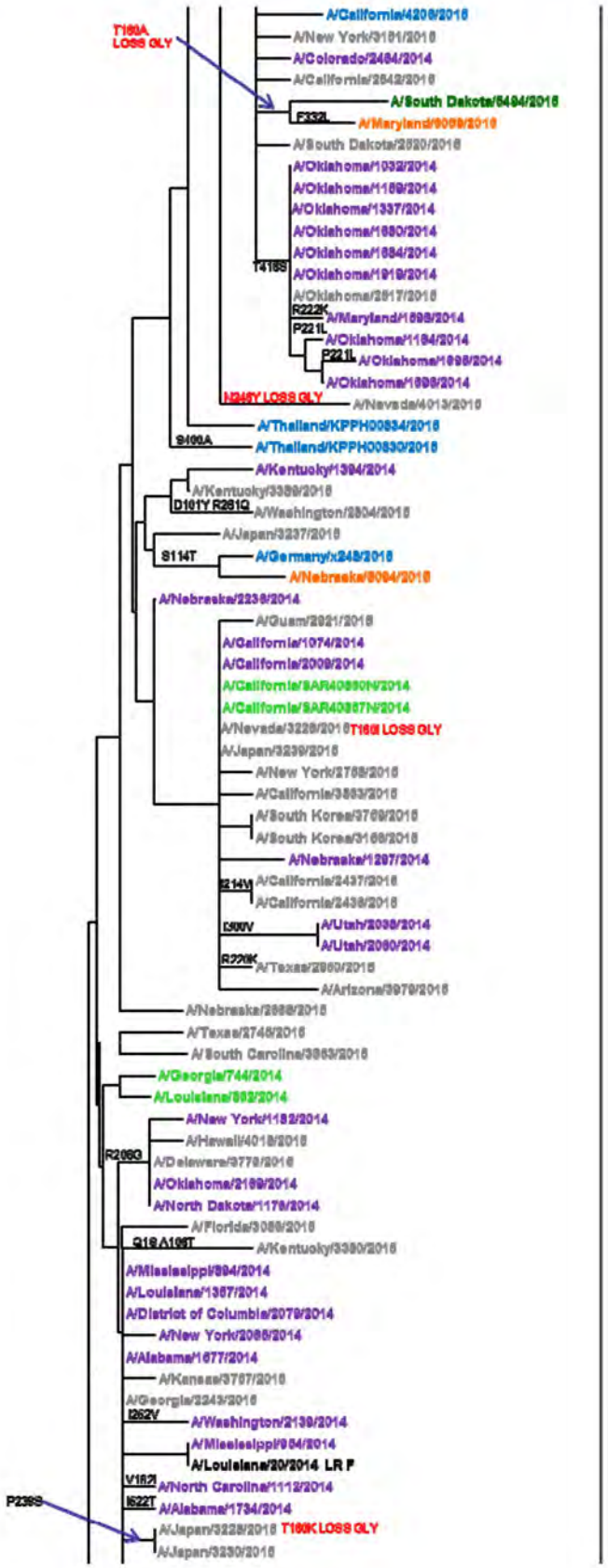
DoD Global, Laboratory-Based, Influenza Surveillance Program



3C.2a

Cleared, 88PA, Case # 2015-5508.

DoD Global, Laboratory-Based, Influenza Surveillance Program



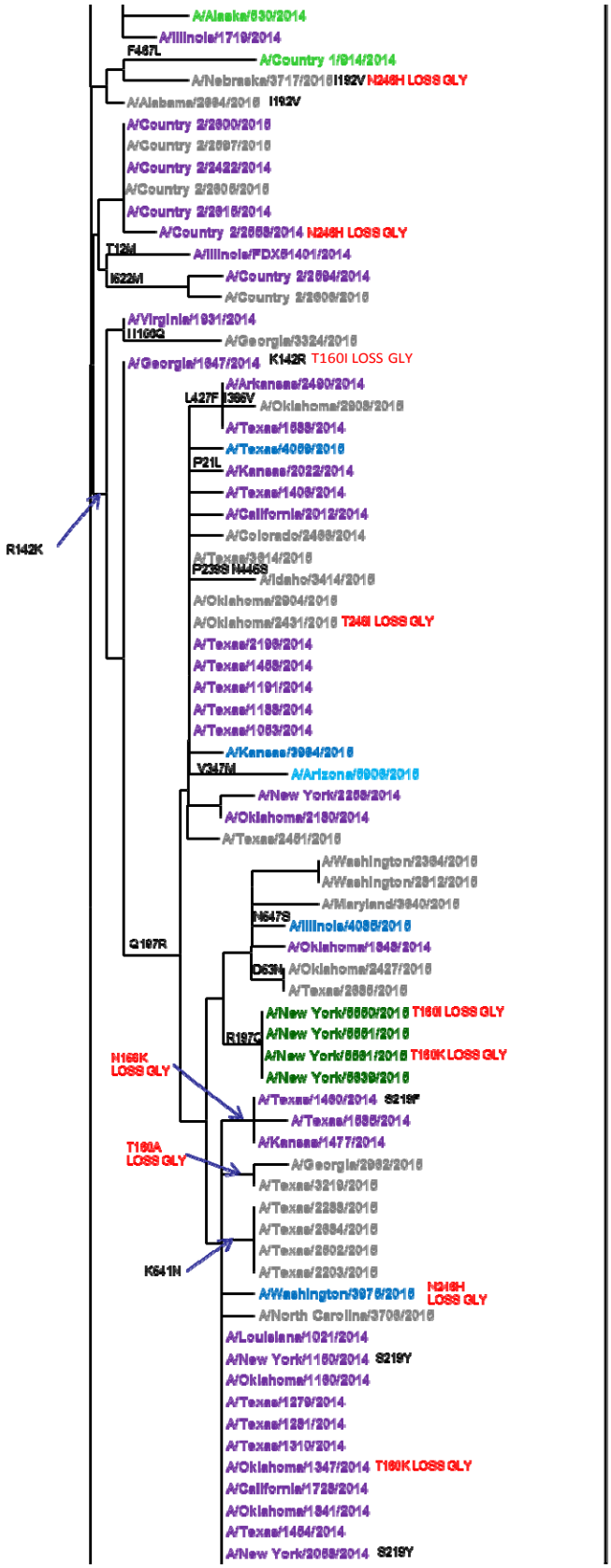
3C.2a

Cleared, 88PA, Case # 2015-5508.

DoD Global, Laboratory-Based, Influenza Surveillance Program

3C.2a

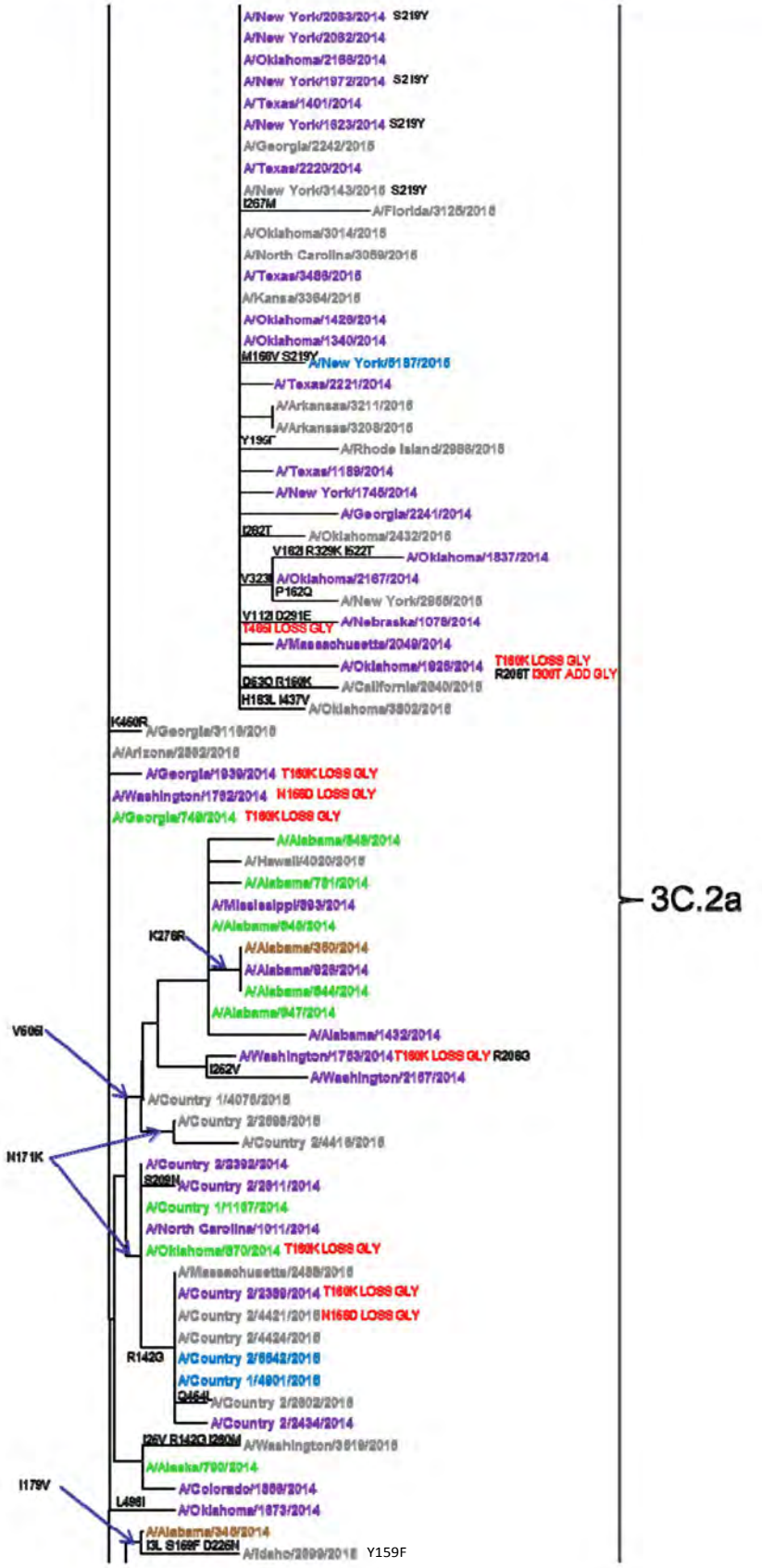
Cleared, 88PA, Case # 2015-5508.



3C.2a

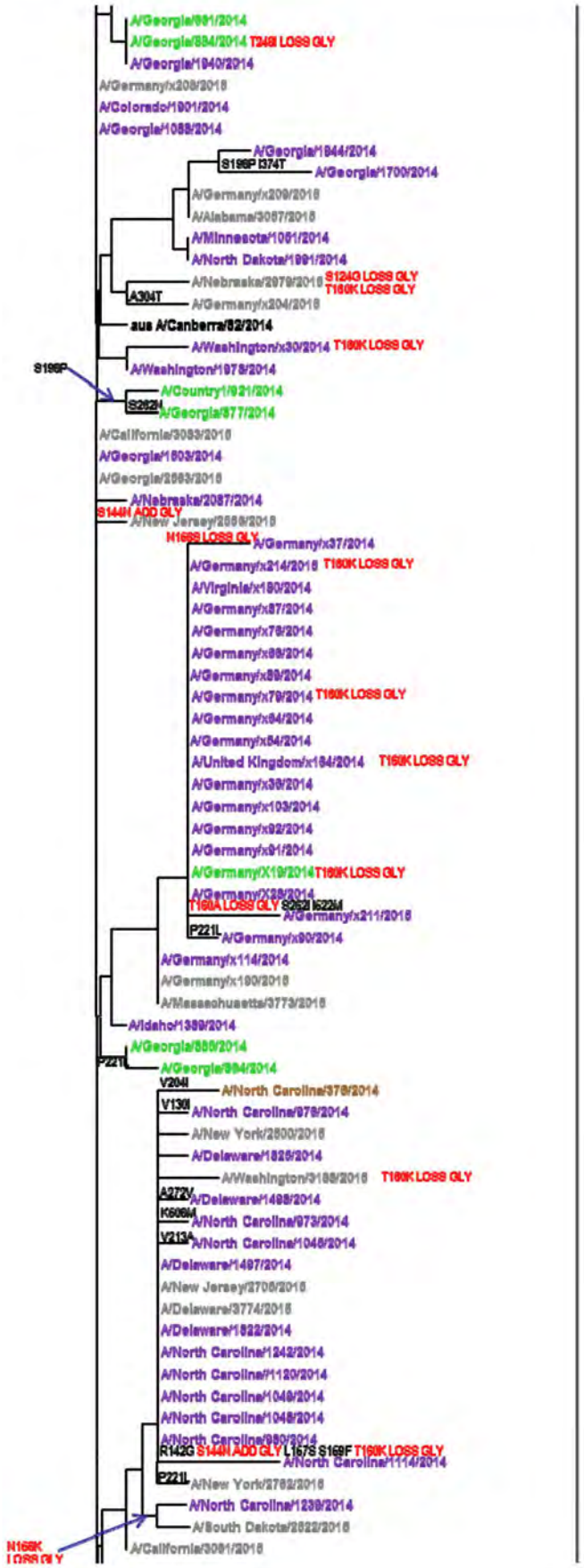
Cleared, 88PA, Case # 2015-5508.

DoD Global, Laboratory-Based, Influenza Surveillance Program



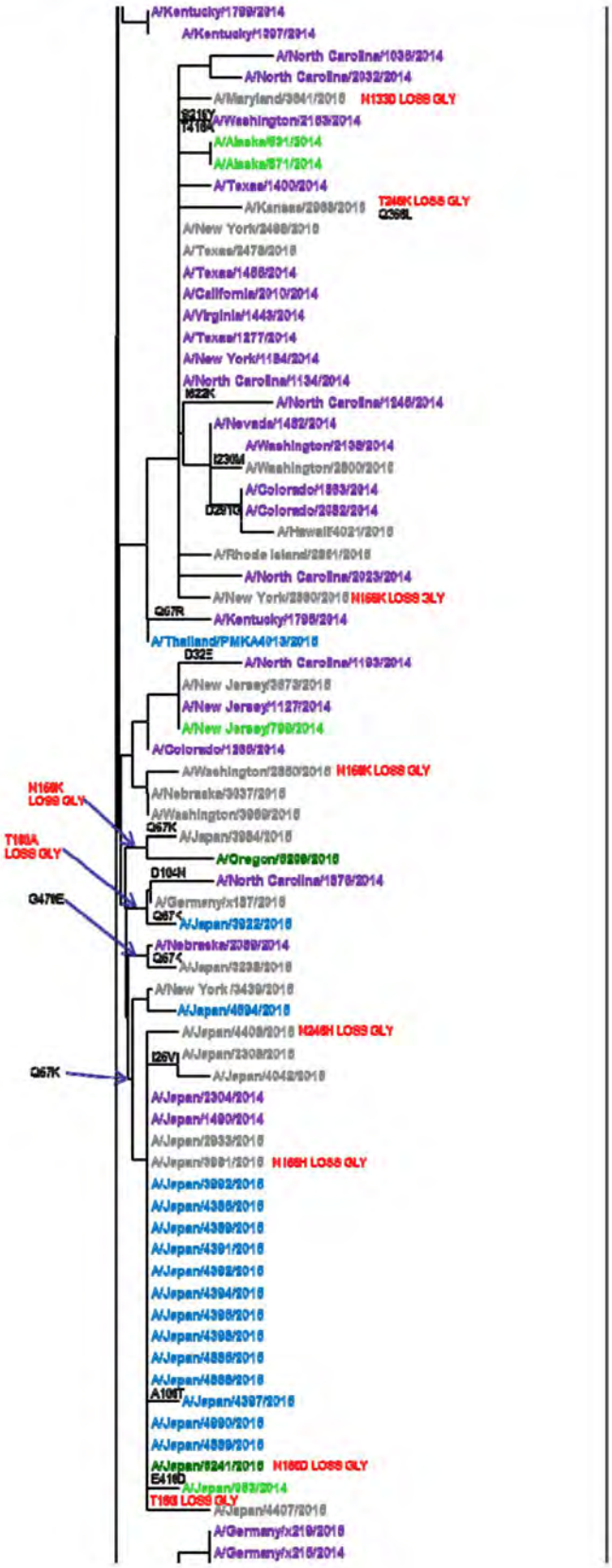
Cleared, 88PA, Case # 2015-5508.

DoD Global, Laboratory-Based, Influenza Surveillance Program



Cleared, 88PA, Case # 2015-5508.

DoD Global, Laboratory-Based, Influenza Surveillance Program



3C.2a

Cleared, 88PA, Case # 2015-5508.

A/Germany/x217/2015
A/Germany/x213/2014 N166H LOSS GLY
A/Germany/x106/2014
A/Germany/x50/2014
N496K
A/Germany/x221/2015
A/North Dakota/3346/2015
N166S LOSS GLY
A/Maryland/2482/2015
A/South Dakota/3726/2015
A/Virginia/4007/2015
A/Massachusetts/2484/2015
A/Washington/1778/2014
A/North Carolina/1129/2014
A/Nebraska/2238/2014 T160R LOSS GLY
A/South Korea/4630/2015
S312G
A/Oklahoma/1030/2014
G78D
A/Georgia/1784/2015 F193S
A/Georgia/756/2014
A/Georgia/1669/2014 T160R LOSS GLY
A/Georgia/1938/2014 T160K LOSS GLY
A/Georgia/1664/2014
F193S
A/Oklahoma/1659/2014
A/Nebraska/2084/2014
A/Georgia/1648/2014
A/Georgia/750/2014
A/Washington/5068/2015
aus A/New Caledonia/71/2014 e
A/Nebraska/2977/2015
A/Nebraska/1882/2014
A/Georgia/661/2014
A/Colorado/1661/2014 N166H LOSS GLY
A/South Dakota/2619/2015
A/Japan/2472/2015
L43M
A/Nebraska/2973/2015
A/Germany/x69/2014
A/Georgia/748/2014
A/Washington/2130/2014
A/Washington/3974/2015
A/Georgia/1785/2014
Y94H S270T
A/California/2639/2015
A/Nebraska/1294/2014 T160K LOSS GLY
A/South Dakota/2018/2014
A/Idaho/3415/2015
I242T
A/Georgia/2669/2014
A/Georgia/2625/2015
I140T I242M
A/South Dakota/2624/2015
A/Arizona/5378/2015
A/Ohio/1381/2014
A/Colorado/1881/2014
A/Germany/X3/2014
A/Colorado/1880/2014
A/Nebraska/2549/2015
A/New Jersey/2871/2015
A/Mississippi/3002/2015
A/Michigan/15/2014 LR F
A/North Carolina/1041/2014
A/Georgia/2015/2014
A/South Dakota/3729/2015
N216D
A/Hawaii/4017/2015
A/Georgia/676/2014
A/Nebraska/1880/2014
A/Georgia/676/2014 T160I LOSS GLY
A/Oklahoma/4095/2015 N6D LOSS GLY
A/Florida/1093/2014
I192T D487N
A/Washington/2802/2015
D54G
A/Nevada/3997/2015
A/South Carolina/4188/2015
A/Washington/2143/2014
A/Georgia/1219/2014
A/Georgia/662/2014
A/Georgia/1937/2014 N166D LOSS GLY
A/Germany/x220/2014
K284T
A/Kansas/3804/2015

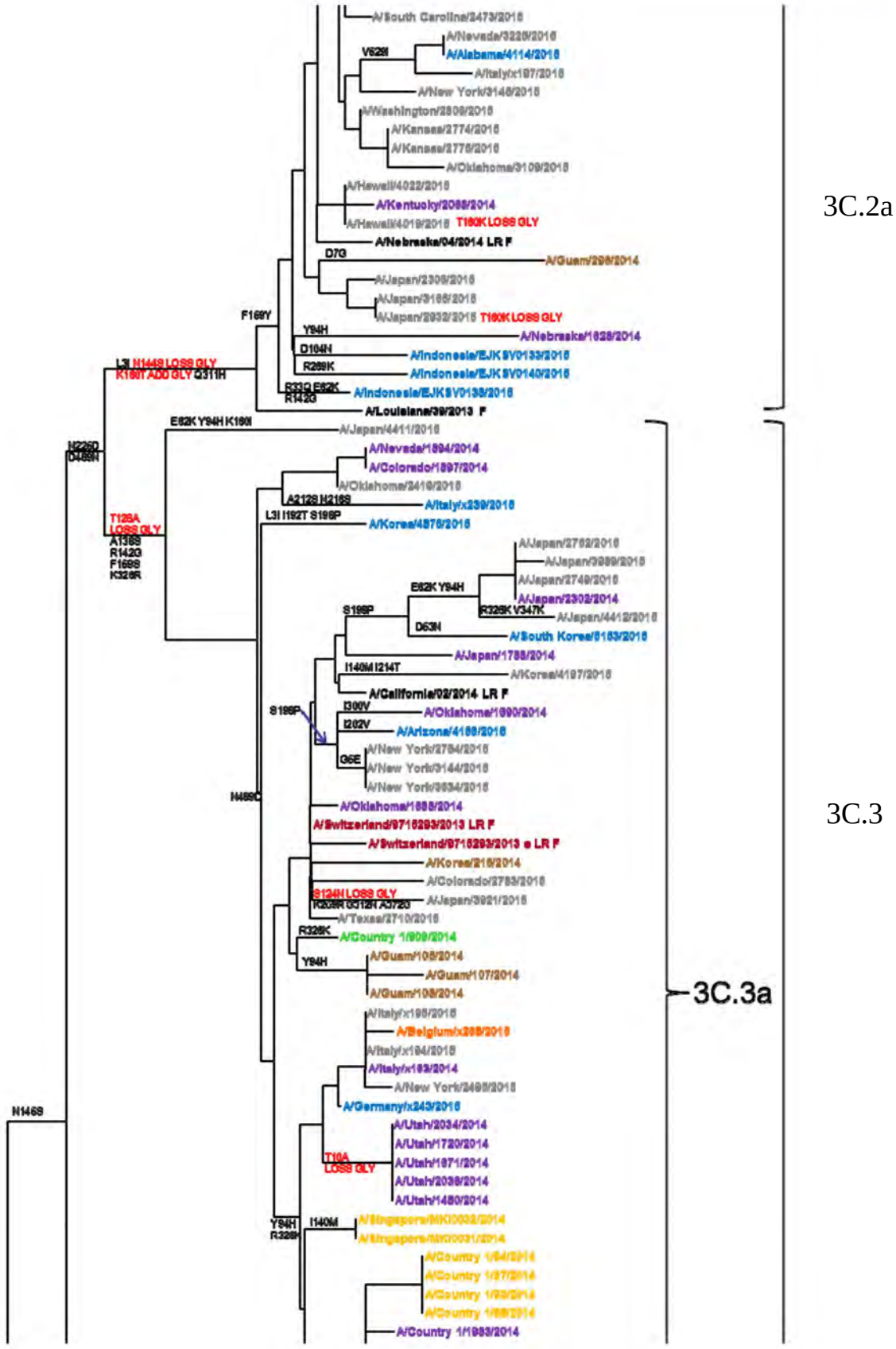
3C.2a

DoD Global, Laboratory-Based, Influenza Surveillance Program

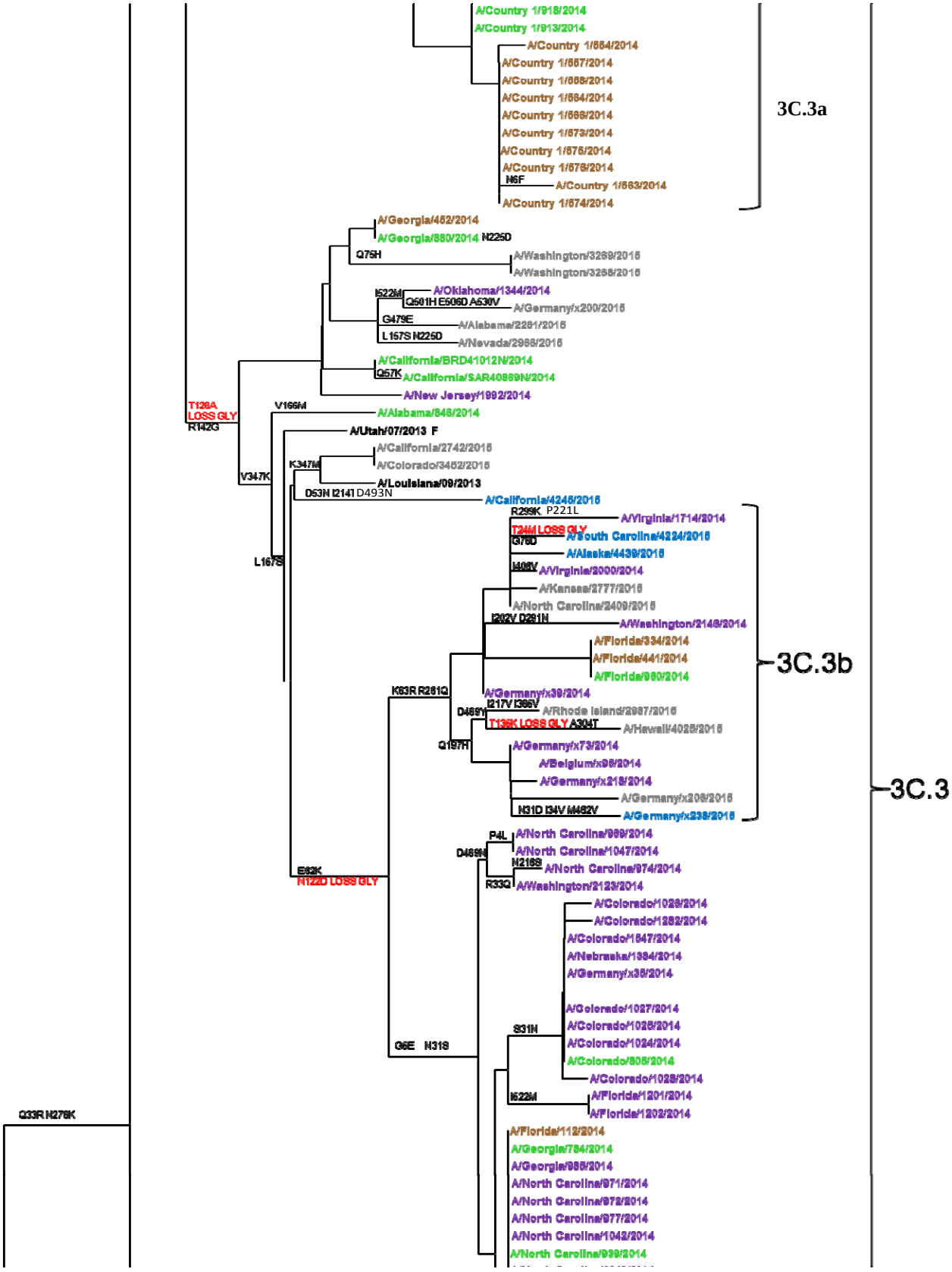
3C.2a

Cleared, 88PA, Case # 2015-5508.

DoD Global, Laboratory-Based, Influenza Surveillance Program

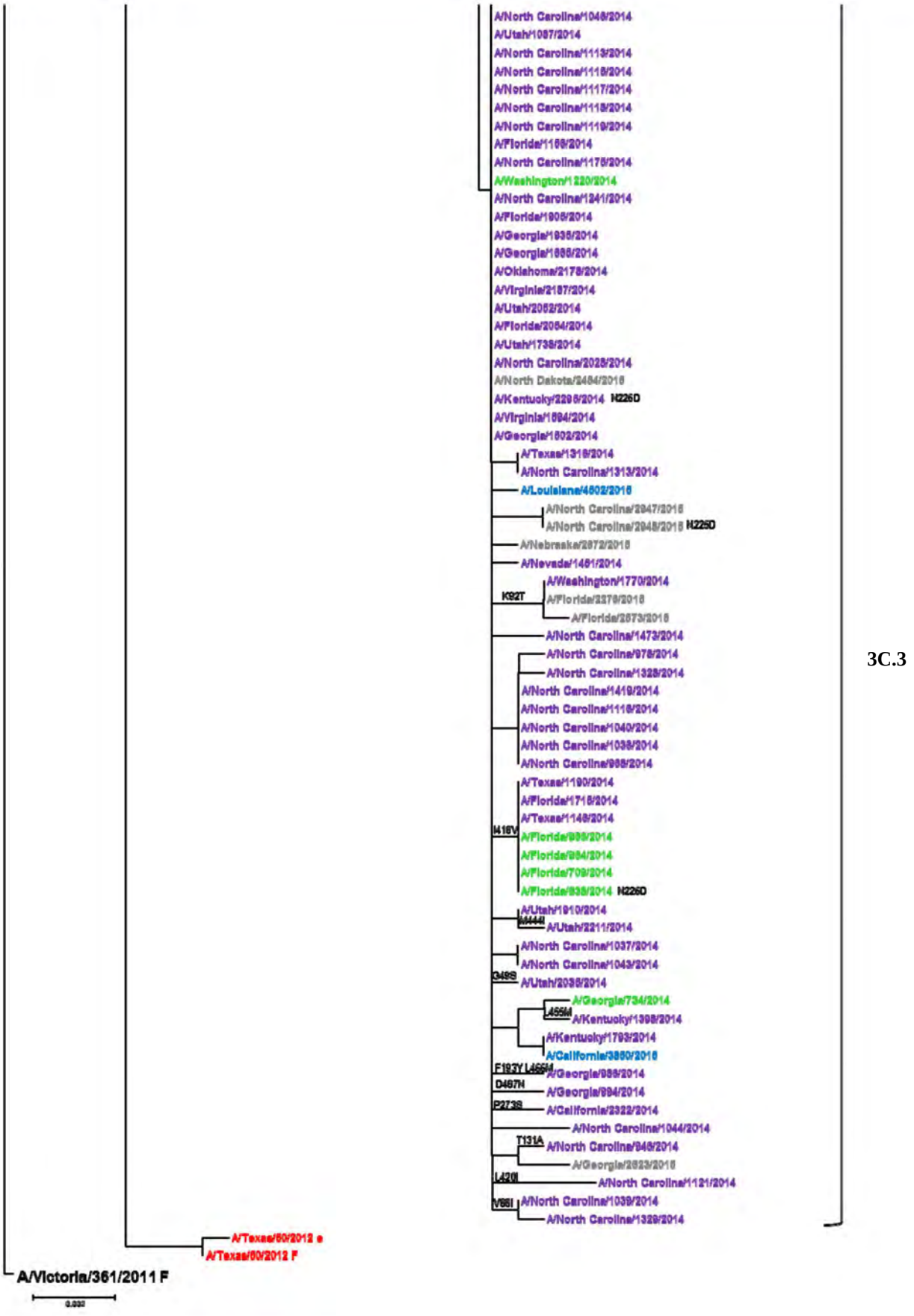


Cleared, 88PA, Case # 2015-5508.



Cleared, 88PA, Case # 2015-5508.

DoD Global, Laboratory-Based, Influenza Surveillance Program

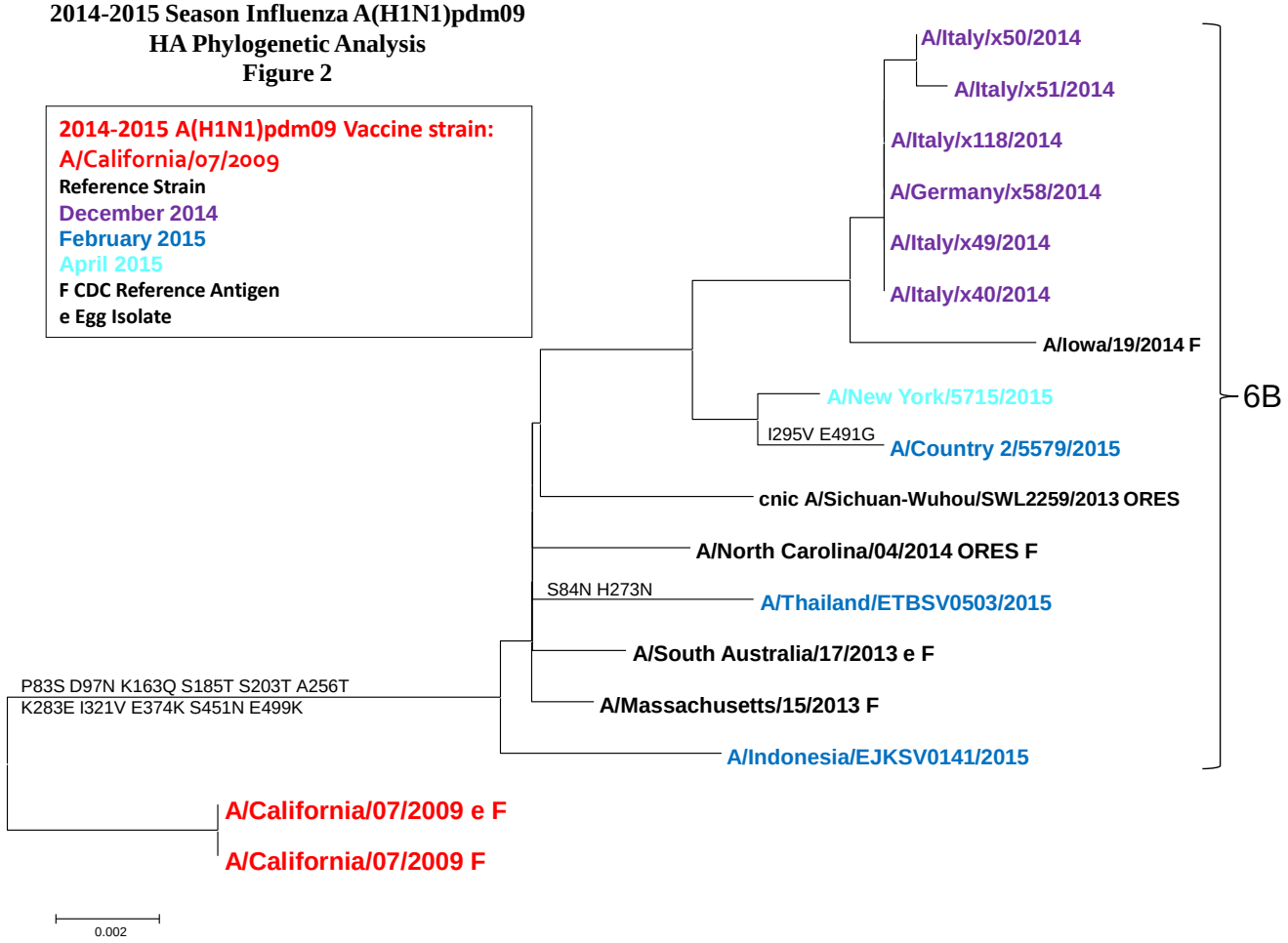


Cleared, 88PA, Case # 2015-5508.

Influenza A(H1N1)pdm09

- The sequences are characterized in a neighbor-joining phylogenetic tree with reference strains rooted from the current vaccine strain, A/California/07/2009 [Figure 2].
- The influenza A(H1N1)pdm09 specimens characterized for this report exhibited an overall protein identity of 97.5-97.8% compared to A/California/07/2009-like vaccine strain.
- All of the influenza A(H1N1)pdm09 viruses in this season contained mutations consistent with one of the circulating subgroups, referred as group 6B. Isolates of this group share two distinguishing mutations, K163Q (lysine to glutamine), and A256T (alanine to threonine).
- Of the 15 mutations present in the influenza A(H1N1)pdm09 specimens, five occurred at predicted antigenic sites and one at the receptor binding site.[2,5]

2014-2015 Season Influenza A(H1N1)pdm09
HA Phylogenetic Analysis
Figure 2



Influenza B

- The influenza B isolates are characterized in lineage specific, neighbor-joining phylogenetic trees with reference strains. The phylogenetic trees are rooted from previous vaccines, B/Florida/04/2006 for Yamagata specimens [Figure 3] and B/Ohio/01/2005 for the Victoria specimens [Figure 4].

- The distinguishing characteristic between the two lineages (Victoria & Yamagata) is defined by an amino acid deletion in viruses belonging to the Yamagata lineage.[1] Ninety-four of the influenza B specimens characterized this season resided within the Yamagata lineage (70%) while 40 resided within the Victoria lineage (30%).

- The influenza B/Yamagata specimens characterized in this report exhibited an overall protein identity of 97.2-97.7% when compared to the 2013-2014 influenza B/Yamagata vaccine strain, B/Massachusetts/02/2012-like virus. When compared to the 2013-2014 influenza B/Victoria vaccine strain, B/Brisbane/60/2008-like virus, the influenza B/Victoria specimens exhibited a protein homology of 98.6-99.6%.

- All 94 specimens of the influenza B/Yamagata lineage classify into group Y3, similar to the 2015-2016 B/Yamagata vaccine strain, B/Phuket/3073/2014-like virus.

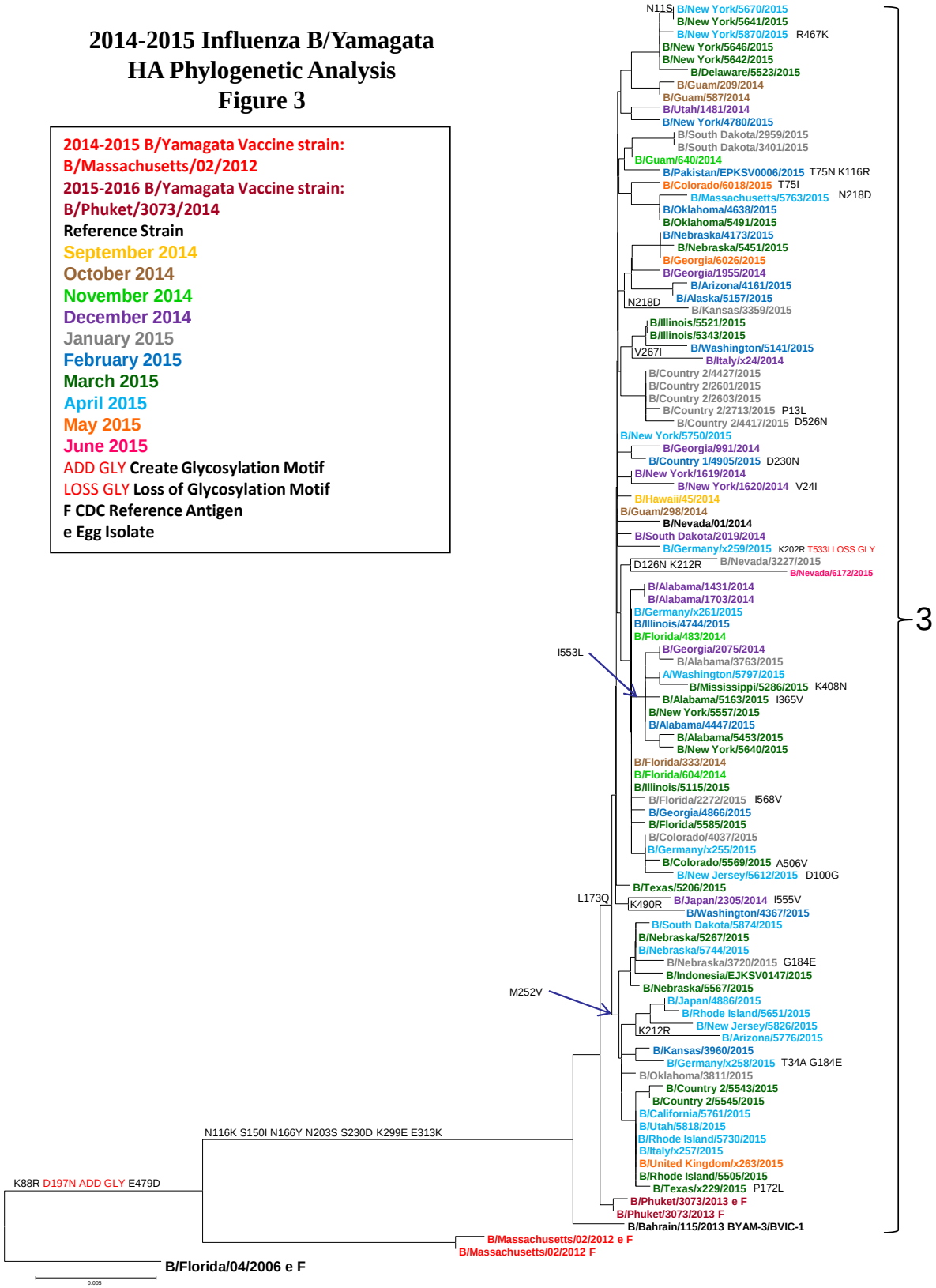
- Thirty-nine of the Influenza B/Victoria specimens this season were characterized as being in group 1A, identified by the mutations N75K (asparagine to lysine), N165K (asparagine to lysine), and S172P (serine to proline). One specimen resided in group 1B, designated by the mutation L58P (lysine to proline) in addition to the 1A mutations.

- Observations are based solely on sequence motifs. Within the influenza B specimens characterized this season, two mutations were observed that could cause loss of a glycosylation motif: T533I (threonine to isoleucine) in the Yamagata lineage and N531D (asparagine to aspartic acid) in the Victoria lineage. Two mutations were observed that could cause a gain of glycosylation motif: D197N (aspartic acid to asparagine) in the Yamagata lineage and A199T (alanine to threonine) in the Victoria lineage.

Cleared, 88PA, Case # 2015-5508.

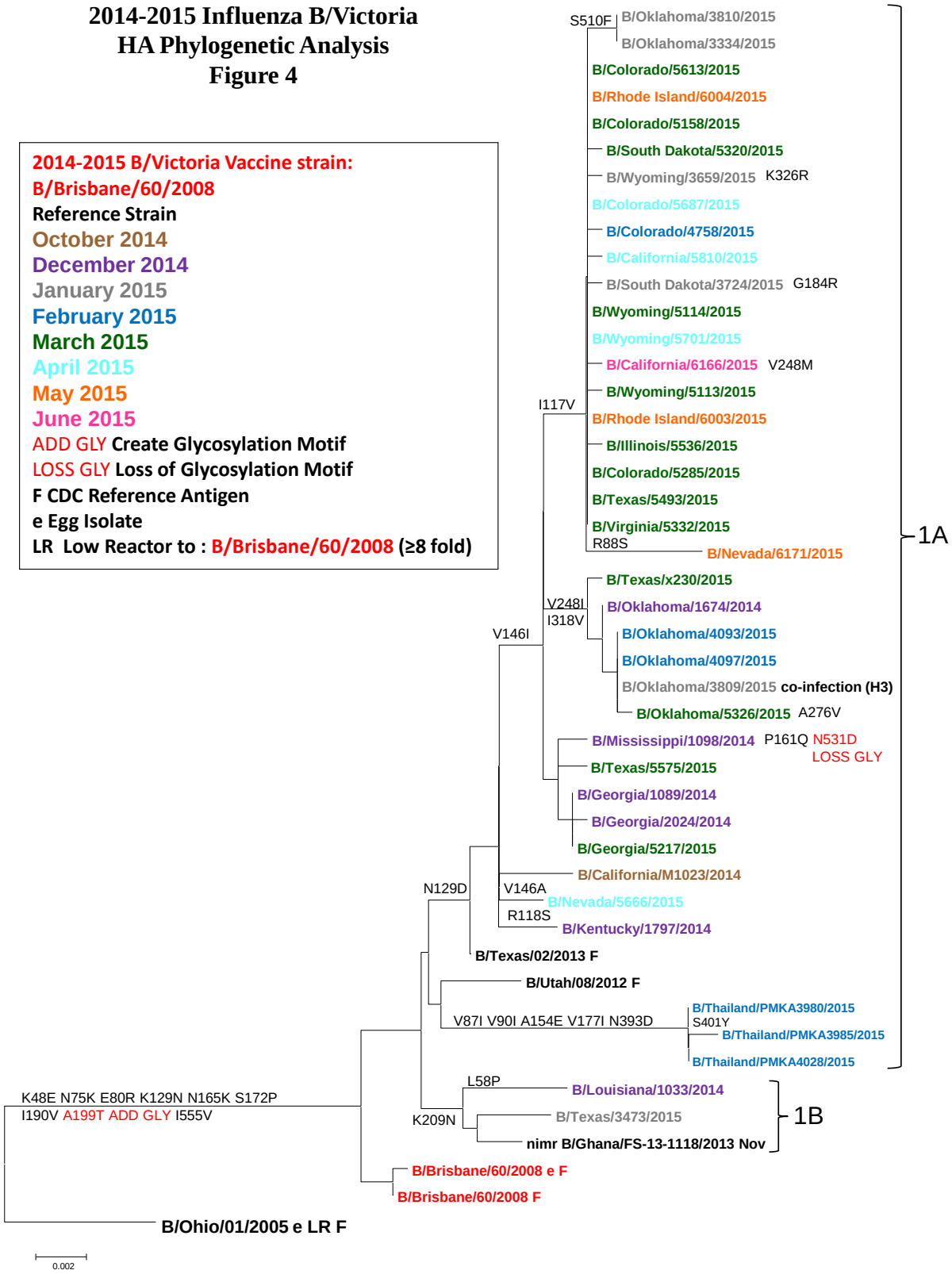
2014-2015 Influenza B/Yamagata HA Phylogenetic Analysis
Figure 3

2014-2015 B/Yamagata Vaccine strain:
B/Massachusetts/02/2012
2015-2016 B/Yamagata Vaccine strain:
B/Phuket/3073/2014
Reference Strain
September 2014
October 2014
November 2014
December 2014
January 2015
February 2015
March 2015
April 2015
May 2015
June 2015
ADD GLY **Create Glycosylation Motif**
LOSS GLY **Loss of Glycosylation Motif**
F CDC Reference Antigen
e Egg Isolate



Cleared, 88PA, Case # 2015-5508.

2014-2015 Influenza B/Victoria HA Phylogenetic Analysis Figure 4



Cleared, 88PA, Case # 2015-5508.

References:

1. Wright, P, Neumann, G, Kaqaoka, Y 2007. Orothomyxoviruses In: Knipe, D.M., Howley, P.M. (Eds.), Fields Virology. Wolters Kluwer, Lippincott Williams & Wilkins, Philadelphia, pp.1692-1740.

2. Kongchanagul A, Suptawiwat, O, Kanrai, P, Uiprasertkul, M, Puthavathana, P, and Auewarakul P (2008) Positive selection at the receptor-binding site of haemagglutinin H5 in viral sequences derived from human tissues. Journal of Gen. Vir. 89, 1805-1810.

3. Cherry JL, Lipman DJ, Nikolskaya A, Wolf YI. Evolutionary Dynamics of N-Glycosylation Sites of Influenza Virus Hemagglutinin. *PLoS Curr Influenza*. 2009 August 18: RRN1001.

4. Deem, M, and Pan, K (2009). The epitope regions of H1-subtype influenza A, with application to vaccine efficacy. Protein Engineering, Design and Selection. 22, no. 9. 543-546.

5. Wolf YI, Viboud C, Holmes EC, Koonin EV, Lipman DJ. Long intervals of stasis punctuated by bursts of positive selection in the seasonal evolution of influenza A virus. *Biol Direct*. 2006; 1: 34. Published online 2006 October 26. doi: 10.1186/1745-6150-1-34.

USAFSAM POCs for sequence data and analysis are:

Maj Robel Yohannes: robel.yohannes@us.af.mil

Mr. Bill Gruner: william.gruner.1.ctr@us.af.mil

Mr. Saul Sarria: saul.sarria.ctr@us.af.mil